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Distribution and population estimates of four crane species in Ethiopia: a global crane hotspot facing increasing threats

Shimelis Aynalem Zelelew, Günter Nowald, George Archibald, Hadis Tadele, Abebayehu Aticho, Kerryn Morrison and Tariku Mekonnen Gutema

Summary

Four species of crane occur in Ethiopia, making the country the most important in Africa for cranes. Black-crowned *Balearica pavonina* and Wattled Cranes *Bugeranus carunculatus*, both listed as Vulnerable, are resident species, while Common *Grus grus* and Demoiselle Cranes *Anthropoides virgo*, both listed as Least Concern, are migrants. We assessed the distribution and minimum population size of four crane species at the most important and main crane sites during 2007–2019. Some potentially important sites, particularly for Black-crowned Cranes, were not able to be surveyed. Breeding areas of resident cranes were also surveyed. Results showed that Black-crowned Cranes were mainly distributed in the Gambela and Lake Tana areas and the minimum population estimate was 3319 individuals. Wattled Cranes were distributed in Bale Mountains National Park, Lake Tana, Jimma wetlands, Bonga and central Rift Valley areas and the minimum population estimate was 366. Migratory Common Cranes were found in Lake Tana, central Ethiopia, south-central Rift Valley, and some places in southern Ethiopia with the highest populations recorded at Lake Tana and secondly at Debre-Zeit. The minimum population estimate for Common Cranes was 70 000. Migratory Demoiselle Cranes were restricted to the northwestern corner of Ethiopia and the minimum population estimate of 21 500 was based on previously published data. Wetlands are the main habitats for cranes and in Ethiopia these habitats are being degraded and are under increasing threat from overgrazing, water extraction for irrigation, siltation, and habitat loss from farming. Key wetland sites that should be protected or sustainably managed include those at Gambela, Lake Tana (Chimba and Yiganda, in particular), and the Boyo and Jimma areas. Cheleleka at Debre-Zeit, Sululta plain around Addis Ababa, and Shesher floodplain in Lake Tana are important roosting sites for Common Cranes.

Keywords Black-crowned Crane, Common Crane, Demoiselle Crane, threats, Wattled Crane, breeding sites, wetlands

Introduction

Globally, eleven of the fifteen species of cranes are considered threatened at the species level, while several additional subspecies are also at risk of extinction (BirdLife International 2020a). Six species of cranes occur in Africa, of which four are found in

Ethiopia. Two species are resident, Black-crowned Crane *Balearica pavonina* and Wattled Crane *Bugeranus carunculatus,* and two species are migratory, Common Crane *Grus grus* and Demoiselle Crane *Anthropoides virgo.*

Black-crowned Cranes, listed as Vulnerable on the IUCN Red List, are resident throughout the western part of Ethiopia, including the western highlands, and in Rift Valley lakes and rivers (BirdLife International 2020b, Yohannes 1996, Nowald *et al.* 2007). They primarily feed in uplands during the non-breeding season, utilizing food resources after crops have been harvested. During the breeding season they use both uplands and wetlands (Urban & Gichuki 1991).

Wattled Cranes are listed as Vulnerable on the IUCN Red List and isolated populations occur in Ethiopia and South Africa, which are not considered different subspecies (Beilfuss *et al.* 2007, BirdLife International 2020c). This species primarily feeds in wetlands during both seasons, although Ethiopian birds may make greater use of drier habitats during the non-breeding season than those in southern Africa (Urban & Gichuki 1991). Nesting pairs of Wattled Cranes establish large (often >1 km^2) territories, generally in shallow wetlands with minimal human disturbance (Urban & Gichuki 1991).

Common Crane is a long-distance migrant that predominantly winters in northern Africa, including Ethiopia (Johnsgard 1983, Ellis *et al* 1996, Nowald *et al.* 2007, Ojaste *et al.* 2020). During both migration and wintering, this species prefers to forage in agricultural fields, pastures, and meadows, and to roost in shallow lakes, bogs, rivers, along the edges of reservoirs, and in other wetlands (Archibald & Lewis 1996, Nowald 1996).

The range and status of the Demoiselle Crane in Ethiopia is unclear, and its distribution has retracted considerably due to human pressure (Johnsgard 1983). Although little is known about this species' foraging habitats, they seem to use drier open fields with dispersed trees of *Balanites aegyptica*, and have been observed flying to agricultural fields in far north-western Ethiopia (Gebremedhin *et al.* 2009)(Fig.1).

Figure 1. Demoiselle Crane roosting site at Tekeze River, Kafta Sheraro National Park (photo: Abadi Mehari Abrha).

The breeding season of cranes in Africa, though still imperfectly understood, is also likely to be affected by the alternation of wet and dry seasons (Fishpool & Evans 2001). The annual cycle of cranes can be divided into a 3–5 month breeding period and a longer 7–9 month non-breeding period (Archibald & Lewis 1996). Except

for Wattled Cranes (Tarboton 1984) and Sarus Cranes *Grus antigone* (Sundar 2009), which remain on their breeding territories throughout the year, other crane species are largely gregarious during the non-breeding period and they migrate or are nomadic.

The major threat facing cranes in Africa is the loss, transformation, and degradation of their habitat, particularly wetlands (Tarboton 1984, Treca 1996, Nowald *et al.* 2007, Aynalem & Bekele 2008a). Behind this threat lies a combination of causal factors, which are all strongly linked to an expanding human population; these include development and expansion of intensive agriculture, wetland conversion to agriculture, and draining and irrigation projects (Daddy & Ayeni 1996, Aynalem & Bekele 2008a, 2008b).

Limited information is available on the distribution, nest sites, and population status of cranes in Ethiopia (Ash & Atkins 2009, Redman *et al.* 2009, Beilfuss *et al.* 2007, Aticho *et al.* 2018, Hadis 2018). The objectives of this study were to assess the distribution and population size of all four crane species in select areas of Ethiopia; to investigate potential nesting sites; and to investigate the main threats to crane habitats.

Methods

Study sites

Survey sites were selected based on information of crane occurrence gathered mainly from local communities during crane monitoring which began in 2007, and also from consulting the literature (Beilfuss *et al.* 2007, Nowald *et al.* 2007, Gebremedhin *et al.* 2009, Ash & Atkins 2009, Redman *et al.* 2009). Eleven survey sites were selected based on the known presence of cranes (Fig. 2). These sites were mainly wetland areas where it is easier to find cranes than in drier or upland foraging areas. For Black-crowned and Wattled Cranes, crop fields located adjacent to wetlands were also included. We surveyed the most important and main crane sites in Ethiopia. However, some potentially important sites were not possible to be surveyed, particularly for Black-crowned Cranes, and these include the northern corner of Lake Turkana at the border of Kenya and Ethiopia, the southern part of Ethiopia, and some sites within Gambela National Park that are only accessible by aircraft. For Common, Wattled and Demoiselle Cranes almost all the best sites were surveyed.

A total of 75 surveys from 2007 to 2019 were conducted. Due to logistical, financial and capacity constraints, surveys were not conducted in 2010, except for Demoiselle Cranes, nor in 2016 or 2018. Survey sites are listed below, and the number of surveys conducted at each site is shown in brackets.

1. North-western Ethiopia: Lake Tana area wetlands, including Chimba, Yiganda, Dirma, and Fogera floodplains (mainly Shesher and Wallala) (16); and Kafta-Sheraro National Park (7)
2. Central Ethiopia: Debre-Zeit area, including Akaki (Aba-Samuel reservoir), Cheleleka, and associated wetlands near Addis Ababa (Sululta) (9)
3. South-central Ethiopia: Chuche, Wanchicho and Archuma wetlands (12), Dalocha and Wondogenet (3), and Boyo wetland (3)

4. South-western Ethiopia: Jimma wetlands, including Cheleleki and Boye (11) and the Bonga area, including Alemgono and Doli wetland in Gimbo district (8)
5. South-eastern Ethiopia: Bale Mountain National Park (BMNP) (1) and Melka Wakena (1)
6. Gambela area (1)
7. Other opportunistic sightings outside of the main survey sites (3)

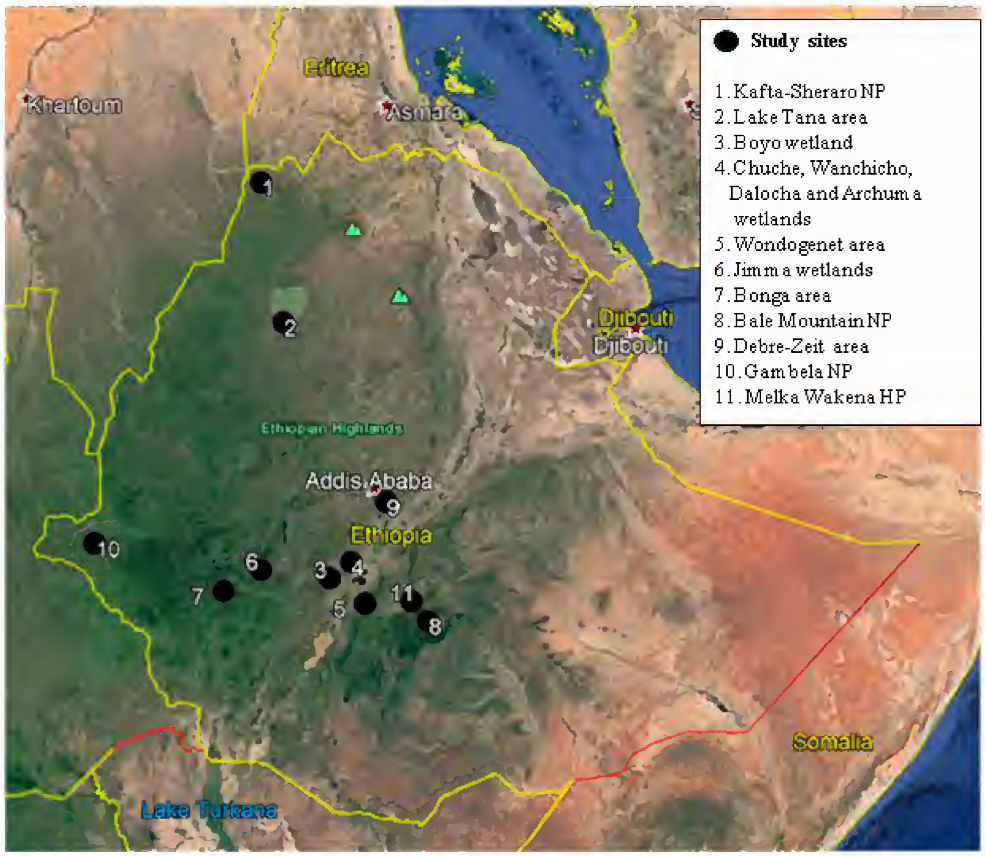

Figure 2. Map of the surveyed sites in Ethiopia.

Survey methods

Surveys were mostly accomplished within 10–15 days by two teams who surveyed the northern and southern routes respectively. The coordinates of each study site were recorded as well as the habitat type, such as crop fields or wetlands, and whether the site was used for nesting or roosting. Coordinates for each group of cranes were also recorded.

For Black-crowned and Wattled Cranes, a transect line was walked along the edge of the wetland and any crop fields. Transect line lengths ranged from 500 to 1000 m, depending on the size and accessibility of the site (Sutherland 1996, Lloyd *et al.* 1998). Because flock sizes are relatively small for these species, exact counts were made. To minimize disturbance, particularly when there were large flocks of

Common Cranes, a waiting period of 3 to 5 min before counting was applied (Sutherland 2000, Hostetler & Main 2001). Because juveniles had not yet fledged, they were counted under 'nesting sites', but were not included in population estimates.

Counting Common Cranes during the daytime is very difficult because they disperse widely in crop fields while foraging. However, despite daytime behaviour, they come together at night-time roosting sites. Individuals of this species fly at the same time, often in large flocks. For this reason Common Crane numbers were only estimated at roost sites during the late afternoon as they flew into their roosts, and during the early morning before they left their roosts. Roosting sites were surveyed only at Lake Tana, Debre-Zeit, Wanchicho, Chuche, Archuma, Boyo, and other smaller sites, e.g. Sululta, Muketri and Aba-Samuel near Addis Ababa, and a few others. The number of flocks was recorded using direct observation with binoculars and spotting scopes. The total number of cranes was estimated by a factor of ten (e.g. 10, 20,...100). Flocks were assigned a flight takeoff direction (south, west, north, and east) to avoid double counting, and each counter was assigned to count in one direction only (Bibby *et al.*, 1998).

Very few Demoiselle Cranes were observed and these were counted opportunistically with population estimates based on Gebremedihin *et al.* 2009.

Minimum population estimates

Minimum population estimates for each species were made using the largest number of individuals observed at one survey site per year summed across all the survey sites for that year. Based on our experience and the narrow survey period, it is unlikely that cranes moved long distances, i.e. between survey sites, and could have been counted more than once during any survey year. Since the survey effort made for each site was not uniform throughout the study period and not all sites were able to be counted every year, it was not feasible to apply any statistical tests. Similarly, our results do not represent the population size of each species for the country, but are rather a minimum estimate for some of the most important crane sites in Ethiopia.

Breeding areas

Breeding sites of Black-crowned and Wattled Cranes were identified based on the presence of non-fledged juveniles, which indicated that the area was being used for nesting. We also relied on unpublished data, reports, and published literature to identify breeding areas for the two resident crane species (Nowald *et al.* 2007, Aynalem *et al.* 2011, Aticho *et al.* 2018).

The habitats of breeding cranes were noted, as well as any threats at each site, although this was not done systematically. Definitions of habitats used were:

1. Wetlands: areas that are covered by water seasonally or all year round, including marshes, estuaries, and mudflats situated at river mouths, and along rivers
2. Floodplains: nearly flat plains along the course of a stream or river that are naturally subject to flooding during periods of high discharge or in the rainy season; however, the areas will have little vegetation cover
3. Lakes: areas filled with water, localized in a basin surrounded by land, apart from any river or other outlet that serves to feed or drain the lake. Crane nests were found along vegetated lakeshores on elevated ground, and at one site, nests were located in small lakes or ponds surrounded by water

Results

Black-crowned Crane

Distribution

The Black-crowned Crane is distributed in the north-western, central, and south-central Rift Valley areas and in south-western parts of Ethiopia (Bonga, Gambela, and the Jimma area). The largest single concentrations of this species were found in Gambela (n=1880) and Lake Tana areas (n=1619) in 2009 and 2019, respectively (Table 1). A significant number of Black-crowned Cranes were also found in the southwestern regions of the country, including the Jimma area wetlands, such as Boye and Cheleleki. Smaller numbers were found in the Cheleleka Lake and the Debre-Zeit area. They were also recorded in Boyo and Archuma wetlands. However, no observations were recorded in lakes Ziway, Langano, or Abijjata although visits were made several times (Table 1).

Minimum population estimate

The maximum total number of 3319 Black-crowned Cranes was recorded in 2019, which included the Gambela area for the first time. Therefore, the total population is expected to exceed this number because our study did not cover all of the breeding sites in the country, nor were all of the study areas surveyed each year. This result could serve as baseline information that will be expected to increase as surveys are improved in the future. The number of cranes counted varied considerably between years (Table 1).

Wattled Crane

Distribution

The distribution of the Wattled Crane can be divided into breeding and non-breeding ranges. While Wattled Cranes were located in the Lake Tana area in the northwest and in the Jimma area in the southwest during both breeding and non-breeding seasons, at other sites their presence was seasonal. They were found in the Boyo wetland, Melka Wakena reservoir, Archuma wetlands, and Chuche and Wanchicho areas in south-central Ethiopia only during the non-breeding season. In Bale Mountain National Park, Wattled Cranes were only present during the breeding season from August to November (Tadele 2018). Strongholds of the non-breeding population appear to be the Melka Wakena hydropower reservoir and the Boyo wetland (Table 1).

Minimum population estimate

A maximum of 366 Wattled Cranes were recorded during the breeding and non-breeding seasons in 2017 (Table 1).

Common Crane

Distribution

Common Cranes were recorded in north-western Ethiopia, in the Lake Tana area, in central Ethiopia, in the Debre-Zeit area, and in the south-central Archuma wetlands, Chuche, Wanchicho and also Dalocha areas (Table 1). These sites were known roosting places, but it does not mean that Common Crane do not occur in other places. Because this species is migratory, large flocks occur in scattered locations given suitable

conditions. Common Cranes can also be found on the Sululta plain and at the Akaki Aba-Samuel reservoir near Addis Ababa.

Minimum population estimate

The migratory population of Common Cranes in Ethiopia has been estimated at 67150 in 2014 (Nowald *et al.* 2014). During our survey in 2015, 70000 were estimated, which nearly matches the estimate of Nowald *et al.* (2014) using the same flock-counting method. In the Lake Tana area, 20000 or more cranes have been counted regularly since 2009. But more recently their numbers at Lake Tana have significantly reduced (n=10309 in 2019) due to intensive agriculture/irrigation and invasive species (SAZ pers. obs.).

Demoiselle Crane

Distribution

Ash & Atkins (2009) reported the occurrence of this species in three places, including Lake Tana, Gallabat, and Aseita, but at other sites its occurrence was uncertain. However, during the study period, Demoiselle Cranes were restricted mostly to the northwestern corner of Ethiopia as passage migrants. This species was not recorded at any survey site outside of this area. The occurrence of this species in Kafta Sheraro National Park (Tekeze River) was only confirmed by the study team in 2011, although the population found was small.

Minimum population estimate

During our surveys, only three Demoiselle Cranes were counted in Kafta-Sheraro National Park in February 2011. However, 21500 Demoiselle Cranes were reported from this same area during February 2009 (Gebremedihin *et al.* 2009). We therefore used the record of Gebremedihin *et al.* (2009) as our minimum population estimate for this migratory species.

Table 1. Exact counts of Black-crowned (BCC) and Wattled Crane (WC), and estimates of Common (CC) and Demoiselle (DC) Cranes from survey sites in Ethiopia (2007–2019). Numbers in parentheses following the study sites refer to site locations on the map (Fig. 1). 'Others' refers to cranes opportunistically observed outside of the survey sites. Numbers in bold represent the highest annual count; x = no survey was conducted; 0 = survey was conducted, but no cranes were observed; [a]Nowald *et al.* 2014; [b]NABU crane report, 2019; [c]Gebremedhin *et al.* 2009; [d]Woldemariam *et al.* 2018.

Year	Species	Kafta-Sheraro NP (1)	Lake Tana area (2)	Boyo (3)	Chuche Wanchicho Dolocha Archuma (4)	Wondo genet (5)	Jimma wetlands (6)	Bonga area (7)	Bale Mountain NP (8)	Debre-Zeit area (9)	Gambela area (10)	Melka Wakena HP (11)	Others	Total
2007	BCC	x	1102	14	x	0	25	x	x	6	x	x	24	1171
2008	BCC	x	572	x	x	x	x	x	x	x	x	x	x	572
2009	BCC	x	1619	x	x	x	x	x	x	x	x	x	x	1619
2011	BCC	x	496	x		x	x	x	x	x	x	x	x	496
2012	BCC	0	1107	x	20	x	62	x	x	2	x	x	x	1245
2013	BCC	x	x	x	x	x	315	x	x	x	x	x	x	315
2014	BCC	x	890	x	x	x	412	x	x	x	x	x	x	1302
2015	BCC	x	650	65	0	x	214	0	x	4	x	x	x	933
2017	BCC	x	932	x	x	x	433	27[d]	x	x	x	x	x	1392
2019	BCC	x	1245[b]	11	0	x	179	X	0	4	1880	0	0	3319
2007	WC	x	5	56	17	1	x	x	x	0	x	x	4	83
2008	WC	x	12	x	x	x	x	x	x	x	x	x	x	12
2009	WC	x	27	x	x	x	x	x	x	x	x	x	x	27
2011	WC	0	26	x	54	x	x	x	x	x	x	x	x	80
2012	WC	0	30	163	21	x	4	x	x	0	x	x	x	218
2013	WC	x	x	x	x	x	19	x	x	x	x	x	x	19
2014	WC	x	30	x	x	x	28	x	x	x	x	x	x	58
2015	WC	x	18	132	23	x	18	1	x	x	x	x	x	192
2017	WC	x	10	78	72	x	28	9[d]	x	x	x	169	x	366
2019	WC	x	12[b]	151	0	x	4	x	0	0	0	136	0	303
2007	CC	x	3807	27	9600	0	x	x	x	34750	x	x	5066	53250
2008	CC	x	305	x	x	x	x	x	x	x	x	x	x	305

Year	Species	Kafta-Sheraro NP (1)	Lake Tana area (2)	Boyo (3)	Chuche Wanchicho Dolocha Archuma (4)	Wondo genet (5)	Jimma wetlands (6)	Bonga area (7)	Bale Mountain NP (8)	Debre-Zeit area (9)	Gambela area (10)	Melka Wakena HP (11)	Others	Total
2009	CC	x	21508	x	9500	x	x	x	x	28000	x	x	x	59008
2011	CC	0	22000	x	14100	x	x	x	x	9350	x	x	16720	62170
2012	CC	0	10000	x		x	0	x	x	10000	x	x	x	20000
2013	CC	x	30000	x	7800	x	x	x	x	12450	x	x	16900	67150[a]
2014	CC	x	0	x	x	x	x	x	x	x	x	x	x	0
2015	CC	x	30000	1000	15000	x	x	x	x	10000	x	x	14000	70000
2019	CC	x	10319[b]	x	x	x	x	x	x	x	x	x	0	10319
2009	DC	x	0	x	x	x	x	x	x	x	x	x	x	21500[c]
2010	DC	x	0	0		0	0	0	0	0	x	x	0	3

Nesting sites of Black-crowned and Wattled Cranes

During our surveys, most of the breeding sites for both Black-crowned and Wattled Cranes occurred in the Lake Tana area in northwestern Ethiopia. For Black-crowned Cranes in the Jimma wetlands, a total of seven and nine juveniles were recorded in 2014 and 2015, respectively.

Wattled Crane nests were found in the Lake Tana area, Jimma wetlands, and in Bale Mountain National Park. During the first week of February 2012, we found four breeding pairs of Wattled Cranes, each with a single pre-fledged juvenile, and 10 non-breeding birds in Chimba, Lake Tana area. The pre-fledged juveniles were about two-weeks old. An additional two pre-fledged birds were also recorded at the end of February of the same year. In Jimma, one pre-fledged juvenile, one sub-adult (both in February 2014), and a fledged juvenile (2015) were recorded. However, in Boyo four fledged juveniles were also recorded in 2012 (Feb), and another four fledged juveniles were recorded in mid-2016 (Jun). In February 2016, one pair with a pre-fledged juvenile was also recorded in the Bale Mountain National Park. In this park, during a nesting study by Hadis (2018), a total of six chicks were recorded in 2015 (n= 2), 2016 (n=3) and 2017 (n=1).

Crane habitats and threats

The habitats, and their threats are summarized in Table 2. None of the sites, even National Parks, are fully protected, and they suffer from agricultural encroachment, drainage for irrigation, infestations of invasive plant species, as well as other threats. Some roosting sites, such as Cheleleka around Debre-Zeit, are being converted into agricultural land. The central Rift Valley areas such as Chuche, Wanchico and Archuma wetlands, water is being drained for agricultural purposes. The occurrence of water hyacinth *Eichhornia crassipes* in the Lake Tana area is an increasing threat to the Common Crane roosting site, because the plant impedes movement, the cranes are forced to use only shallow water areas without hyacinth for roosting. The hyacinth at Lake Tana is expanding at an alarming rate.

Table 2. Habitat type and threats observed during 2007–2019.

Region	Study sites	Habitat type	Threats	Species	Use
North-west	Lake Tana	Lake	Siltation and water hyacinth infestation	BCC, WC	Breeding & Non-Br
North-west	Chimba and Yiganda	Wetland	Overgrazing and agricultural encroachment	BCC, WC	Breeding & Non-Br
North-west	Dirma	Wetland	Invasion by water hyacinth, siltation, overgrazing	BCC	Breeding & Non-Br
North-west	Shesher and Wallala	Floodplain	Agricultural encroachment, sequential farming and draining	CC, BCC	Non-breeding
North-west	Kafta-Sheraro National Park	Acacia woodland	Agricultural encroachment	DC	Non-breeding
Central	Cheleleka	Lake	Irrigation (water draining), pollution by agricultural pesticides, and domestic waste dumping	BCC, CC	Non-breeding
South-central	Chuche	Floodplain	Water draining, siltation, invasive weeds	BC, CC	Non-breeding
South-central	Wanchicho	Floodplain	Water draining, siltation, invasive weeds	BC, CC	Non-breeding
South-central	Archuma	Floodplain	Water draining, siltation, invasive weeds	BC, CC	Non-breeding
South-central	Boyo	Wetland	Irrigation, overgrazing, siltation and invasive species	WC, CC, BCC	Non-breeding
South-west	Cheleleki	Wetland	Overgrazing	BCC, WC	Breeding site
South-west	Boye complex	Wetland	Overgrazing and conversion	BCC, WC	Breeding site
South-west	Bonga area	Wetland	Wetland loss and degradation	WC	Non-breeding
South-west	Gambela	Wetland	No threat	BCC	Breeding
South-east	Bale Mountain National Park	Afro-alpine	Overgrazing and agricultural encroachment	WC	Breeding
South-east	Melka Wakena HP reservoir	Reservoir	No threat	WC	Non-breeding

Discussion

Black-crowned Crane

Substantial numbers of Black-crowned Crane occur in Ethiopia, including an estimated 1000 around Lake Tana and at least 100 in Ethiopia's southern Rift Valley (Williams *et al.* 2003, Beilfuss *et al.* 2007). Our survey estimates show that the population of Black-crowned Crane in Ethiopia is more than reported thus far and that the Gambela and Lake Tana areas hold the largest populations. The Lake Tana population has been surveyed in numerous years and our results agree with the Crane Monitoring Group's report in 2007 (Nowald *et al.* 2007). More studies are still needed to fully assess the Gambela population. We suspect the population estimate for this region may be higher because previous estimates during 2014 and 2019 counted more than 400 cranes each year. These results were not included in our minimum population estimate to avoid the possibility of double-counting with the Gambela population. Therefore, future surveys should aim to count these two populations on the same day. Black-crowned Cranes were often found nesting in smaller wetlands than Wattled Cranes, except in the Bale Mountain National Park.

Wattled Cranes

This species has a large distribution range and occurs in different habitats across the country (Urban & Walkinshaw 1967). However, within this range, the species is restricted to particular sites. Previous studies reported 62 Wattled Cranes at Boyo wetland (Yilma 1998). In 2012, however, 163 were recorded, the largest number of this species recorded in Boyo during our survey. Previous reports suggested that the Ethiopian population is less than 200 (Beilfuss *et al.* 2007). More recently, in 2017, 319 individuals were recorded in the central Rift Valley area and 28 were recorded in the Jimma area (Aticho *et al.* 2018, Haddis 2018). During this study, 366 Wattled Cranes were counted in 2017, which includes data from the Bonga area (Woldemariam *et al.* 2018). This indicates that the population of Wattled Cranes in Ethiopia could be estimated at more than 366 if other sites that were not visited are included. Our data suggest that Lake Tana could be the most important nesting site for Wattled Cranes in Ethiopia because breeding was recorded during all years when surveys were conducted.

Common Cranes

The majority of Common Cranes remain in Ethiopia from October to March, but some stay until April and mid-May (Nowald *et al.* 2010). They are mainly found in the western highlands and frequently in the Rift Valley areas (northwestern and central Ethiopia). Nowald *et al.* (2010) suggested that this species could be found throughout the country except in the very dry northeast. However, the occurrence of this species is highly associated with the presence of suitable feeding grounds and roosting sites. A similar ecological survey suggested that Common Cranes preferred aquatic ecosystems of the larger freshwater lakes and rivers, highland streams and marshes, and the species feeds in grasslands, including the highland acacia grasslands, short savannah grassland, and semi-desert savannah as well as agricultural land (Yohannes 1996, Nowald *et al.* 2014, Aynalem *et al.* 2011).

Demoiselle Cranes

A survey of Demoiselle Cranes recorded 21 500 cranes in 2009 in Kafta-Sheraro National Park (Gebremedihin *et al.* 2009). Although supposedly a passage migrant, local communities have reported that Demoiselle Cranes do overwinter in the area between December and April. Our survey conducted in the first week of February 2011, however, recorded a much lower number, which suggests that further research is needed to understand the ecology of the species in Ethiopia in general and in Kafta-Sheraro National Park in particular.

Breeding sites

Breeding sites of cranes could not be found everywhere because the suitability of nesting sites is determined by the presence or absence of disturbance, adequate water levels, and other factors that influence nest site selection criteria. Several authors have reported that cranes nest where the risk of predation is minimal (Archibald & Meine 1996, Claire *et al.* 1996, Bento *et al.* 2007, Sundar 2009).

Threats

Globally, freshwater ecosystems have been altered by human disturbance, such as agriculture, urban development, impoundment, channelization, mining, road construction, and species introduction (LaBonte *et al.* 2001). This has led to severe deg-

radation and loss of biodiversity (Vinson & Hawkins, 1998) and as a result, these ecosystems have become one of the most endangered on the planet (Dudgeon *et al.* 2006).

All of the wetland habitats where cranes are found in Ethiopia are unprotected, including biosphere reserves, except for the Bale Mountain National Park, which is legally protected and currently under consideration to be listed as a World Heritage site. The main threats to wetlands are overgrazing, water extraction for irrigation, siltation, and sequential farming (Aynalem *et al.* 2011, Mekonnen & Aticho, 2011, Aynalem 2017, Aticho *et al.* 2018, Hadis 2018).

Lake Cheleleka, the Boyo wetland, and the floodplains of Archuma, Chuche, and Wanchicho are areas with high human population densities and thus the threats to cranes in these areas are directly related to competition for resources, with irrigation and overgrazing being the primary threats. The early arrival of Common Cranes causes considerable crop damage because the duration of their stay is longer and leads to prolonged damage (Nowald *et al.* 2014, Hadis 2018). This situation could become a growing challenge. Cattle grazing also directly affect *Eleocharis* spp. that is food sources for Wattled Cranes mainly in the Boyo area. In this area, poor land management and water drainage for agricultural purposes is an increasing challenge. Agricultural development is being practised without caution and this activity is destroying the breeding sites for cranes. Local people are diverting the natural water flow to cultivate crops and vegetables. Rapid sedimentation resulting from severe soil erosion in the surrounding uplands also affects the hydrological regime because it speeds up drying and destroys the vegetation, particularly herbaceous macrophytes. Emphasis should be given to save the remaining wetlands through various site-relevant interventions.

The main features of the nesting behaviour of cranes are generally similar in all species, except for Blue Crane *Anthropoides paradiseus* and Demoiselle Crane, 13 species build nests in shallow wetlands with low emergent vegetation (Johnsgard 1983). However, across Ethiopia the breeding and wintering sites of cranes are under continuous threat (Aynalem 2017, Aynalem *et al.* 2017). Further, deliberate nest site destruction, killing for bushmeat, or poaching cranes for illegal trade, are not common in Ethiopia (Zelelew 2013). The culture and religious taboos of the country play a significant role in protecting wild birds directly, but do not prevent habitat destruction.

Some farmers have shown an interest in killing or scaring cranes to protect their crops from damage. At all study sites, Wattled Cranes are perceived as crop pests by farmers. Similarly, in the Lake Tana area, Black-crowned Cranes consume local crops like tef *Eragrostis tef*, finger millet *Eleusine coracana*, and rice and as a result farmers want to get rid of cranes in the area (Aynalem *et al.* 2011). The same is true in Boyo, where Wattled Cranes cause extensive damage by foraging on germinating maize seeds, and the mature crops of wheat and tef.

In conclusion, minimum population estimates of cranes during our survey (2007–2019) were estimated at 3319 Black-crowned Cranes, 366 Wattled Cranes, 70 000 Common Cranes, and 21 500 Demoiselle Cranes. Although our surveys suggested an increase in crane populations in Ethiopia, we suspect that the increase was due to improved and more frequent surveys.

Based on the occurrence of cranes, there are key sites identified during our survey that we recommend should be protected or otherwise sustainably managed. The Gambela area wetlands, the Lake Tana wetlands (Chimba and Yiganda in particular),

and the Boyo and Jimma wetlands are key sites for crane conservation. In addition, Cheleleka, in the Debre-Zeit area, the Sululta plain around Addis Ababa, and the Shesher floodplain in Lake Tana are important roosting sites for Common Cranes.

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Shimelis Aynalem Zelelew
Bahir Dar University, College of Agriculture and Environmental Sciences, Bahir Dar, Ethiopia
**Corresponding author, e-mail: shimelisay@yahoo.co.in, shimelis.aynalem@gmail.com*

Günter Nowald
Crane Conservation Germany, Crane Information Center, Lindenstraße 27, D - 18445 Groß Mohrdorf, Germany

George Archibald
International Crane Foundation, E11376 Shady Lane Rd., Baraboo, WI 53913, United States

Hadis Tadele
Madawalabu University, School of Biodiversity and Natural Resources, Bale-Robe, Ethiopia

Abebayehu Aticho and Tariku Mekonnen Gutema
Jimma University, College of Agriculture and Veterinary Medicine, Jimma, Ethiopia

Kerryn Morrison
International Crane Foundation/Endangered Wildlife Trust Partnership for African Cranes, Johannesburg, South Africa

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The avifauna of Ankobohobo Wetland, a neglected Important Bird Area in northwestern Madagascar

Fionn Ó Marcaigh, Bruno Andriandraotomalaza Raveloson, Gael Rakotomanga, Anja Navalona Ratianarivo, Jack Baddams, Solohery Rasamison, Jamie Neaves, Peter Long and Thomas Edward Martin

Summary

We present here the first detailed inventory of the birds of Ankobohobo Wetland in northwest Madagascar, based on data collected annually in June and July 2010–2018. These wetlands consist of a *c.*35 km^2 area of mangroves and tidal mudflats which were designated as an Important Bird Area (IBA) within the West Malagasy Wetlands Endemic Bird Area (EBA) in 2001. However, recent and detailed information on their avifauna remains lacking. We used a boat to survey three 4 km stretches of the IBA's river system on four repeated occasions each year, supplemented by opportunistic observations made in various parts of the study area. In total, we detected 59 species in Ankobohobo Wetland through *c.*608 h of observation effort. This includes 26 Malagasy endemics, two Near Threatened species, three Endangered species (Malagasy Sacred Ibis *Threskiornis bernieri*, Malagasy Pond Heron *Ardeola idae*, and Humblot's Heron *Ardea humbloti*), and the Critically Endangered Madagascan Fish Eagle *Haliaeetus vociferoides*. These constitute substantial additions to the inventory of the established Ankobohobo Wetland IBA, which previously stood at 19 species including one Malagasy endemic. We summarise these records here, providing additional details for threatened species. We also report observed threats to the wetlands, particularly with regards to the breeding *H. vociferoides* population, and highlight Ankobohobo as an important conservation priority.

Keywords Endemic, *Haliaeetus vociferoides*, Important Bird Area, Inventory, Mangrove

Introduction

Madagascar possesses one of the most irreplaceable yet threatened biotas on Earth (Myers *et al.* 2000; Goodman and Benstead 2005), which for centuries has been a source of fascination for both the international scientific community (e.g. de Flacourt 1658; Grandidier 1887) and oral tradition and local heritage (Burney and Ramilisonina 1999; Jones *et al.* 2008). Over half (53%) of the island's terrestrial breeding birds are endemic (Warren *et al.* 2013), many of which are now threatened with extinction. These threats have become so great as to prompt concerns that the coming years may represent the "last chance" to safeguard the country's unique natural heritage (Jones *et al.* 2019). A key first step towards safeguarding biodiversity is to identify

priority areas in which to focus conservation resources (Brooks *et al.* 2006). BirdLife International's Important Bird and Biodiversity Area (IBA) programme is a highly successful example, shown to drive tangible conservation outcomes (Donald *et al.* 2019; Waliczky *et al.* 2019).

There are 84 IBAs in Madagascar, but several of these have not had follow-up surveys since they were designated and lack complete species inventories. This includes Ankobohobo Wetland (IBA MG022, BirdLife International 2020a), a relatively small IBA encompassing 34.97 km^2 of mangrove, tidal mudflats, and some sandy beaches. The site is located 80 km northeast of Mahajanga city in the Boeny region of northwestern Madagascar (Fig. 1). Ankobohobo sits between two larger coastal wetland IBAs, Baie de Bombetoka (MG024, 55 km to Ankobohobo's southwest) and the Mahajamba Bay-Anjavavy Complex (MG023, 32 km to the northeast), within the West Malagasy Wetlands Endemic Bird Area (EBA) (ZICOMA 2001). This EBA has been highlighted as being of urgent priority and incomplete knowledge (Stattersfield *et al.* 1998, BirdLife International 2020b). Ankobohobo's IBA designation was based on surveys carried out in 1997, reporting populations of two threatened and biome-restricted species (Endangered Humblot's Heron *Ardea humbloti* and Critically Endangered Madagascan Fish Eagle *Haliaeetus vociferoides),* along with 17 others (BirdLife International 2020a). Other than this, no further information on the site has been published apart from two species-specific reviews of the status of *H. vociferoides* which include data from the IBA (Rabarisoa *et al.* 1997, Razafimanjato *et al.* 2014).

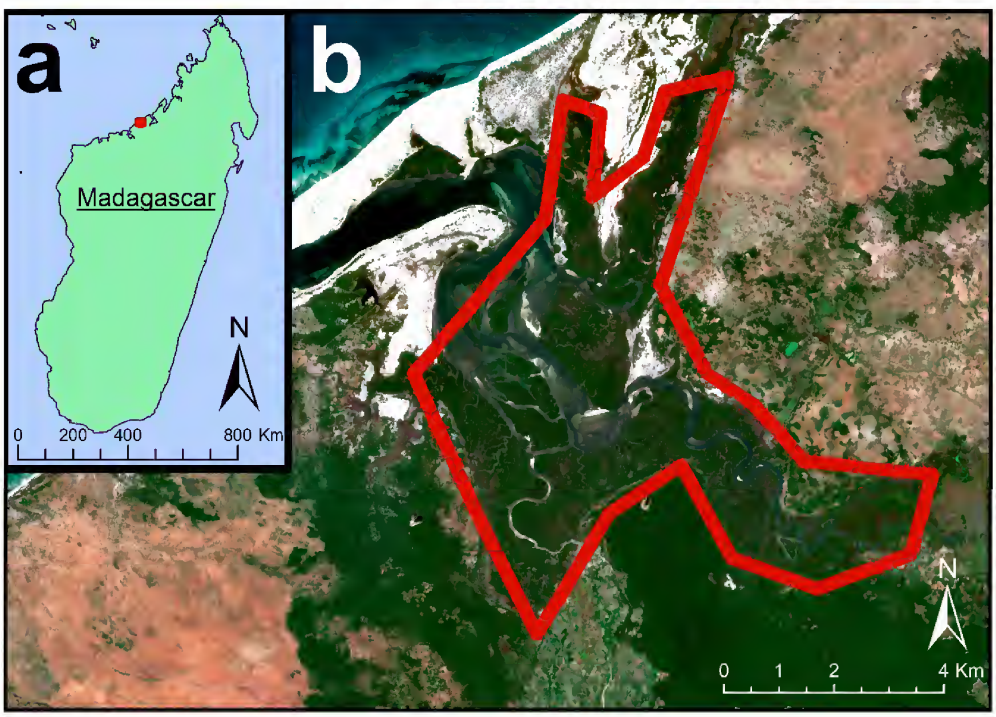

Figure 1. **a)** Map of Madagascar with the study area marked in red. **b)** Satellite photo of the study area, with the boundary of the Ankobohobo Wetland IBA shown in red. Created in ArcMap (ESRI 2020) using Copernicus Sentinel-2 imagery (ESA 2020), with IBA boundary data provided by BirdLife International (2020a).

This is an important knowledge gap, as the conservation situation in Ankobohobo, as in Madagascar generally, has deteriorated considerably in the two decades since the site was first gazetted. A disproportionate number of Madagascar's threatened endemic birds rely on wetland ecosystems (Young *et al.* 2014), but Madagascar's mangroves are increasingly threatened by demand for charcoal and *sokay*, a type of lime used to strengthen houses that requires mangrove wood and seashells to produce (Scales *et al.* 2018). Protection of Madagascar's important sites thus depends on further research into how its species are distributed. Palfrey *et al.* (2019) recorded numerous previously undocumented species in the Mariarano forest region adjacent to Ankobohobo, but noted that Ankobohobo would benefit from more intensive exploration. We therefore present here the most detailed information published to date on the avifauna of this globally significant IBA.

Methods

We surveyed the birds of Ankobohobo Wetland between 2010 and 2018, as part of a long-term ecological monitoring programme run in partnership between Operation Wallacea, the Malagasy NGO 'Development and Biodiversity Conservation Action for Madagascar' (DBCAM), the University of Antananarivo, and local community forest management groups. Surveys took place in the dry season over periods of 6–7 weeks between June and August, through semi-structured boat surveys. We conducted these boat surveys on three stretches of the IBA's river system, each 4 km long, each on four repeated occasions per year. These surveys involved recording every bird seen or heard, while travelling in one direction along a set route. We also made incidental opportunistic records in the course of completing ecological research into the local Nile Crocodile *Crocodylus niloticus* population, and through other casual exploration of the study area.

Using records from all our surveys and opportunistic observations, we compiled a full inventory of all species we had detected in Ankobohobo Wetland, following the taxonomy of Gill *et al.* (2020). We obtained the global conservation status of each species from the IUCN (2020), and noted where a species was endemic to the Madagascar biodiversity hotspot as defined by Myers *et al.* (2000). We recorded species as notable range extensions if they were not indicated as occurring in the study area in maps provided in authoritative online resources (BirdLife International and NatureServe 2014, Del Hoyo *et al.* 2020, IUCN 2020) or in three of the region's widely-used ornithological references (Safford & Hawkins 2013, Sinclair & Langrand 2013, Hawkins *et al.* 2015). We also assigned categorical abundance estimates for each species in our inventory based on frequency of observations, following Palfrey *et al.* (2019). Abundant species were those typically recorded multiple times each day in suitable habitat, common species were typically recorded at least once per day, fairly common species were typically recorded about once per week, uncommon species had an average of fewer than five or six records per field season, and rare species were known from fewer than five observations within the study area. We also noted the author who observed each species. Finally, as recommended by Lees *et al.* (2014), we collated all the photographs we had taken of study species within the study area, and uploaded them to the 'Internet Bird Collection' online depository (Lynx Edicions 2020), which has since become part of the Macaulay Library (Cornell Lab of Ornithology 2020). These photos are available at https://www.macaulaylibrary.org/ using the catalog numbers in Table 1, providing visual verifications for as many species in our inventory as possible.

Results

We recorded 59 species in Ankobohobo Wetland, including 26 endemic species (44% of all species detected), two Near Threatened species, three Endangered species, and one Critically Endangered species. We obtained photographic records for 27 species in our inventory, and a sound recording for one additional species for which we could not obtain a photograph (Madagascan Swamp Warbler *Acrocephalus newtoni*). Table 1 summarizes our findings. The following accounts provide further details on notable records such as endemic and threatened species.

Table 1. Checklist of bird species recorded in Ankobohobo Wetland between 2010 and 2018. All taxonomy follows Gill *et al.* (2020). Species marked * are endemic to the Madagascar biodiversity hotspot as defined by Myers *et al.* (2000). Species marked † are assessed as threatened or near threatened by the IUCN (2020). Species marked (I) are introduced to the study area. Abundance estimates are denoted as follows: A = abundant; C = common; Fc = fairly common; U = uncommon; R = rare. Initials in the 'observers' column indicate authors possessing records of each species. Species which have been observed by three or more authors are notated 'multiple'. FÓM is Fionn Ó Marcaigh, BAR is Bruno Andriandraotomalaza Raveloson, JN is Jamie Neaves, and JB is Jack Baddams. Catalogue Numbers correspond to photographs and sound recordings from this study available on the Macaulay Library (Cornell Lab of Ornithology 2020).

Common name	Scientific name	Abundance	Observers	Catalog No.
White-faced Whistling Duck	*Dendrocygna viduata*	R	FÓM	
Knob-billed Duck	*Sarkidiornis melanotos*	R	FÓM	
Lesser Flamingo†	*Phoeniconaias minor*	R	BAR	
Reed Cormorant	*Microcarbo africanus*	U	BAR, JN	ML712311
African Openbill	*Anastomus lamelligerus*	R	BAR	ML712312
Malagasy Sacred Ibis*†	*Threskiornis bernieri*	R	BAR	ML712310
African Spoonbill	*Platalea alba*	U	BAR, JN	ML712305
Little Bittern	*Ixobrychus minutus*	R	BAR, JN	
Black-crowned Night Heron	*Nycticorax nycticorax*	Fc	Multiple	ML204695631
Striated Heron	*Butorides striata*	Fc	Multiple	ML204678131
Squacco Heron	*Ardeola ralloides*	U	BAR, JN	
Malagasy Pond Heron*†	*Ardeola idae*	R	JN	ML712380
Grey Heron	*Ardea cinerea*	Fc	BAR, JN	ML712379
Humblot's Heron*†	*Ardea humbloti*	R	BAR	
Purple Heron	*Ardea purpurea*	Fc	Multiple	ML204678081
Great Egret	*Ardea alba*	Fc	Multiple	ML713014
Black Heron	*Egretta ardesiaca*	U	BAR, JB	ML204695731
Dimorphic Egret*	*Egretta dimorpha*	C	Multiple	ML204695781
African Darter	*Anhinga rufa*	U	Multiple	ML204695601
Madagascan Harrier-Hawk*	*Polyboroides radiatus*	R	JB	ML204678271
Black Kite	*Milvus migrans*	R	FÓM	ML713003
Madagascan Fish Eagle*†	*Haliaeetus vociferoides*	U	Multiple	ML712309
Madagascan Buzzard*	*Buteo brachypterus*	R	FÓM	ML713004
Bat Hawk	*Macheiramphus alcinus*	R	JN	
White-throated Rail*	*Dryolimnas cuvieri*	C	Multiple	ML204678251
Common Moorhen	*Gallinula chloropus*	Fc	FÓM	ML713009
Crab-plover	*Dromas ardeola*	R	BAR	
Common Ringed Plover	*Charadrius hiaticula*	U	BAR	
White-fronted Plover	*Charadrius marginatus*	U	BAR	

Common name	Scientific name	Abundance	Observers	Catalog No.
Eurasian Whimbrel	*Numenius phaeopus*	Fc	BAR, JN	
Curlew Sandpiper†	*Calidris ferruginea*	Fc	BAR	
Sanderling	*Calidris alba*	U	BAR	
Terek Sandpiper	*Xenus cinereus*	Fc	BAR	
Common Sandpiper	*Actitis hypoleucos*	Fc	Multiple	ML204695741
Common Greenshank	*Tringa nebularia*	Fc	BAR, JN	
Lesser Crested Tern	*Thalasseus bengalensis*	Fc	BAR	
Malagasy Turtle Dove*	*Nesoenas picturatus*	R	FÓM	
Namaqua Dove	*Oena capensis*	R	FÓM	ML713015
Malagasy Coucal*	*Centropus toulou*	R	FÓM	
Western Barn Owl	*Tyto alba*	R	JN	
Madagascan Nightjar*	*Caprimulgus madagascariensis*	Fc	JN	
Malagasy Black Swift*	*Apus balstoni*	R	FÓM	
Malagasy Kingfisher*	*Corythornis vintsioides*	C	Multiple	ML713010
Olive Bee-eater	*Merops superciliosus*	C	JN, FÓM	ML713012
Malagasy Kestrel*	*Falco newtoni*	R	FÓM	ML713008
Lesser Vasa Parrot*	*Coracopsis nigra*	Fc	JN, FÓM	ML713013
Grey-headed Lovebird*	*Agapornis canus*	R	FÓM	
White-headed Vanga*	*Artamella viridis*	R	FÓM	
Crested Drongo*	*Dicrurus forficatus*	C	JN, FÓM	ML713011
Malagasy Paradise Flycatcher*	*Terpsiphone mutata*	C	JN, FÓM	
Pied Crow	*Corvus albus*	R	FÓM	ML713007
Malagasy Bulbul*	*Hypsipetes madagascariensis*	R	FÓM	
Madagascan Swamp Warbler*	*Acrocephalus newtoni*	Fc	BAR, JB	ML203945641
Common Jery*	*Neomixis tenella*	R	FÓM	
Common Myna (I)	*Acridotheres tristis*	R	FÓM	
Madagascan Starling*	*Hartlaubius auratus*	R	FÓM	
Souimanga Sunbird*	*Cinnyris sovimanga*	R	FÓM	
Madagascan Mannikin*	*Lepidopygia nana*	U	FÓM	
Madagascan Wagtail*	*Motacilla flaviventris*	Fc	JN, FÓM	

Malagasy Sacred Ibis *Threskiornis bernieri* — Endangered

A rare resident. Singles and pairs were observed several times by BAR on sandbanks alongside mangrove-fringed channels in 2011 and 2013 (Fig. 2). The presence of this species here is not unexpected, given known distributions suggest a theoretical occurrence in suitable habitat anywhere on the west coast of Madagascar, and particularly as this section of coast corresponds to the core part of its range (Safford & Hawkins 2013). However, it has not been explicitly reported from Ankobohobo Wetland previously, being absent from the IBA summary for this site (BirdLife International 2020a).

Figure 2. Malagasy Sacred Ibis *Threskiornis bernieri* (photo: Bruno A. Raveloson).

This species has experienced a rapid population decline of over 20% in the last 16 years. The current global population estimate is 1500–1850 birds, which is expected to decline further due to harvesting of eggs, disturbance of nesting sites, and the degradation of wetland habitats in Madagascar (BirdLife International 2020c). Ankobohobo represents an important portion of the wetland habitat that must be protected if this species is to be conserved.

Malagasy Pond Heron *Ardeola idae* — Endangered

Figure 3. Malagasy Pond Heron *Ardeola idae* (photo: Jamie Neaves).

A rare migrant. We have occasionally observed single individuals on sandbanks along mangrove-fringed channels (Fig. 3). The species has a widespread but small population throughout Madagascar, where it breeds in the austral summer between October and March (BirdLife International 2020d). The population of this species has declined substantially in recent decades due to habitat destruction and exploitation at breeding sites (Rabarisoa *et al.* 2020), and the global population is now estimated at just 1100 breeding birds. The species winters on the mainland of East Africa between May and September, but our photograph (ML712380) provides rare documentation of an individual remaining in the breeding range during that time. Wintering records of the species in the adjacent Mariarano forest region have also been reported (Palfrey *et al.* 2019). Rabarisoa *et al.* (2020) recorded 911 instances of this species remaining in Madagascar during the austral winter, but a search of literature and eBird records revealed few other photographs documenting birds in winter plumage in Madagascar. Rabarisoa *et al.* (2020) found western habitats to be particularly important for this species, highlighting the need to protect sites such as Ankobohobo.

Humblot's Heron *Ardea humbloti* — Endangered

A rare resident. Single individuals have occasionally been observed by BAR on sandbanks of mangrove-fringed channels and on coastal beaches. The presence of this species in Ankobohobo has been reported previously (BirdLife International 2020a).

Lesser Flamingo *Phoeniconaias minor* — Near Threatened

A rare visitor to the wetland. BAR observed two individuals in 2011 on a coastal beach on the fringes of Ankobohobo.

Madagascan Starling *Hartlaubius auratus* — Least Concern

A rare visitor to the wetland. A small flock was observed by FÓM above the wetland's main river system in 2018. Usually a bird of forests and shrublands (Safford &

Hawkins 2013), its presence in Ankobohobo likely results from the proximity to the Mariarano Forest, where it was recorded by Palfrey *et al.* (2019).

Madagascan Fish Eagle *Haliaeetus vociferoides* — Critically Endangered

An uncommon resident. Occasionally recorded within the study area (Fig. 4), where a few pairs have been known to nest in tall mangrove trees (BirdLife International 2020a). The maximum number of individuals we observed at a single time was three birds: a breeding pair and one chick. An image providing evidence of breeding can be found in our photographic inventory (ML712417, Fig. 5). The species was observed breeding at this location annually between 2010 and 2017. Individuals have also occasionally been seen passing over the wetlands of the adjoining Mariarano Forest, but they have not been observed to breed there (Palfrey *et al.* 2019). Our observations show that the *H. vociferoides* population in Ankobohobo, while small, is certainly larger than indicated by the last two reviews of the status of this species. Rabarisoa *et al.* (1997) reported only a single bird in Ankobohobo, while Razafimanjato *et al.* (2014) did not represent the species as still persisting here at all. We expect the population size here to be broadly in line with that of the initial IBA assessment of 2–3 breeding pairs (BirdLife International 2020a). There are only an estimated 240 individuals of this species remaining globally (BirdLife International 2020e), marking this Ankobohobo population as significant. However, this population may now be under severe threat. In 2013 the nesting trees where the eagles consistently bred showed signs of human damage, although whether this was due to firewood collection or a deliberate act of persecution remains unclear. As a matter of greater concern, a visit to Ankobohobo on 25 June 2018 by JN revealed that these nesting trees had been completely destroyed, and that deforestation for charcoal production was much more apparent in the area than in previous survey seasons. The 2018 survey season was the first year since 2010 where no breeding birds were recorded, though sub-adult and adult individuals were still observed. These recent disturbances raise serious concerns regarding the future conservation status of the species here.

Figure 4. Madagascan Fish Eagle *Haliaeetus vociferoides* (photo: Jamie Neaves).

Figure 5. Breeding *Haliaeetus vociferoides* (photo: Jamie Neaves).

Discussion

Globally, wetlands are crucial for biodiversity and for humanity, but their protection requires effective governance and better data (Amano *et al.* 2018). Mangroves in particular provide enormous ecosystem services, but may be functionally extinct within 100 years (Polidoro *et al.* 2010). Our surveys in the mangroves of Ankobohobo Wetland have yielded valuable records that boost the known biological value of this IBA. Where previous surveys had recorded 19 species, our records add a further 40, including 25 more endemic species and five that are Threatened or Near-Threatened, thus greatly improving knowledge of the site. The 59 species and 44% endemism rate reported here compare with 95 species and a 66.3% endemism rate in the adjacent Mariarano Forest landscape (Palfrey *et al.* 2019). Lower diversity and endemism are to be expected in Ankobohobo given that it is a smaller and more homogenous area, and a wetland rather than a forest, but our results still highlight its diversity as being of regional importance. Aside from the presence of endemic and globally threatened species here, this relatively small habitat fragment has been shown to support a significant proportion of the region's bird species, as the 59 species reported here represent over a third (35%) of the 168 non-vagrant species known to occur in western Madagascar (Safford & Hawkins 2013). If the boundaries of the Ankobohobo IBA were extended to encompass the Mariarano Forest, then this larger IBA would contain substantially more threatened and range-restricted bird species and greater habitat diversity, and would still be viable for conservation as one unit due to its well-defined and relatively small area. Sites have been similarly combined into complexes elsewhere in western Madagascar, including in the neighbouring Mahajamba Bay – Anjavavy Complex. In addition to its birds, Ankobhobo supports populations of other threatened taxa, for example a roost of approximately 500 Madagascar Flying Fox *Pteropus rufus*, which is considered Vulnerable by the IUCN (2020). The site is also utilized by troops of the Endangered Coquerel's Sifaka *Propithecus coquereli*, a lemur. Thus, if the two sites were combined as one Ankobohobo–Mariarano Complex, this might warrant additional designation, perhaps under the IUCN's Key Biodiversity Area scheme. The long-term monitoring scheme that gave rise to this study could provide data to assess such proposals. Alternatively, as Mariarano and Ankobohobo represent quite different ecosystems, with each supporting different IBA/KBA trigger species, they are also capable of meeting the criteria for these designations independently. Two IBAs in different habitats within a small area would emphasize this region's ecological richness and diversity. Therefore, we recommend that one or other of these approaches be followed, recognizing the international importance of both Ankobohobo and Mariarano so that legal protection may follow.

Our results have highlighted that the Ankobohobo IBA faces severe environmental pressures. The most significant of these concerns, the destruction of *H. vociferoides* nesting sites, but general deforestation (particularly associated with charcoal burning) has been frequently observed here, particularly around the area's periphery. Urgent conservation actions are therefore needed to safeguard the future of the site, and it is likely that the IBA designation alone is not sufficient to provide meaningful protection. Conservation interventions such as community education to highlight the importance of the *H. vociferoides* population, and provision of alternate means of fuel to mitigate deforestation, are recommended.

Decades after the designation of the Ankobohobo Wetland IBA, and centuries after the rich natural heritage of Madagascar began to be formally described, detailed species inventories are still needed for the adequate understanding and protection of the truly remarkable Malagasy wetlands. Such shortfalls in knowledge are a continuing issue with respect to nature conservation in Madagascar and around the world (de Lima *et al.* 2011, Pino-Del-Carpio *et al.* 2014). Malagasy poet Jean-Joseph Rabearivelo used an image of a bird "falling with the night" (Rabearivelo 1934), which may reflect the future of Madagascar's birds without adequate knowledge and protection.

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Fionn Ó Marcaigh*
Department of Zoology, School of Natural Sciences, Trinity College Dublin, Dublin DO2 CX56, Ireland. Corresponding author: omarcaif@tcd.ie

Bruno Andriandraotomalaza Raveloson, Gael Rakotomanga, Anja Navalona Ratianarivo, Jack Baddams, Jamie Neaves, & Thomas Edward Martin
Operation Wallacea Ltd, Wallace House, Old Bolingbroke, Lincolnshire, PE23 4EZ, UK

Solohery Rasamison
Departement de Biologie Animale, Faculte des Sciences, Université d'Antananarivo, Postal Box 906, Antananarivo 101, Madagascar

Peter Long
Biodiversity Institute, Department of Zoology, Tinbergen Building, South Parks Road, Oxford, OX1 3PS, UK

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Forest-dependent birds of the Tugen Hills, Baringo County, Kenya

James Bradley, Simon Carter, David Guarnieri and Jason Fidorra

Summary

We document the forest avifauna of the Tugen Hills, finding 65 forest-dependent species in three forest reserves surveyed. Several species reported here are previously unrecorded from the area, and we document breeding seasonality for a further nine species. Of particular interest in the hills, Thick-billed Seedeaters *Crithagra burtoni* appear distinctly different to the expected subspecies in this part of Kenya, and require further study to determine their taxonomic affinities.

Keywords forest-dependent birds, conservation, distribution, biodiversity/species richness, inventory

Introduction

Forests comprise some of the most imperilled habitats in Kenya (Bennun & Njoroge 1999), and yet site specific information on the presence/absence of forest-dependent bird species is unavailable for many locations, including gazetted and protected forest reserves. The Tugen Hills comprises one such site, whence there have been only occasional species reports in published national bird reviews (e.g. EABR 1983 1984, 1991) or merely range inferences made in regional field guides. Given that the forest reserves of the Tugen Hills are in good condition and may possibly support important populations of representative East African forest birds, a dedicated inventory of the species occurring there is warranted. To survey the forest birds occurring there and compile this information, we visited the three largest tracts of forest in the hills between 2011 and 2018. Inventories such as this may be of use in informing management decisions and in measuring the effectiveness of forest conservation for biodiversity (Bennun & Njoroge 1999).

Study area

The Tugen Hills comprise a linear ridge of hills in central-west Kenya formed by block-faulting, which are semi-isolated within the Rift Valley, and separated from the main western wall of the Rift Valley (the Elgeyu/Tambach Escarpment) by the Kerio Valley (Fig. 1). Centred around the main urban centre of Kabarnet, they remain narrowly connected to the western Kenya highlands by the Kamasian Hills 35 km to the south, at an altitude of *c.* 2000 m. The northern reaches of the Tugen Hills, and part of the study area, rise to almost 2500 m.

Kabarnet, 10 km south of Katimok forest and at a similar altitude to the forest reserves surveyed (2058 m), has an annual mean temperature of 17.8° C with little monthly variation. The mean total precipitation is 1238 mm, with at least 60 mm falling in every month except January and February, and receiving >100 mm in

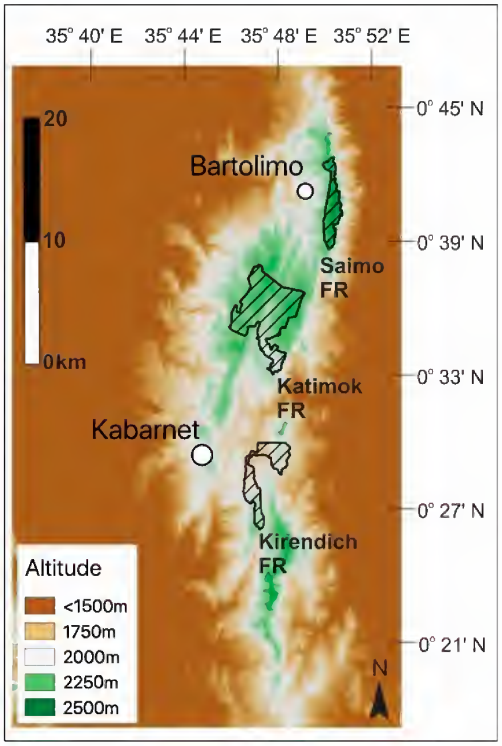

Figure 1. Map of the forest reserves surveyed in the Tugen Hills.

April–August and November (www.climate-data.org).

The largest three tracts of forest in the Tugen Hills—Kirendich, Katimok and Saimo—were surveyed. These forests are comprised primarily of an indigenous vegetation cover, although small areas (up to 20% total area) are planted with exotic species such as *Cupressus lusitanica*, *Eucalyptus saligna*, *Grevillea robusta* and *Pinus patula*, interspersed with secondary regrowth.

Kirendich Forest comprises *c.* 680 ha of forest and is divided into a northern section of *c.* 480 ha (Tarambas Forest) to the east of Kirendich dam at 1800–2150 m and a southern section of *c.* 200 ha (Kinyo Forest) to the south of the dam at 1850–2150 m. The two sections are connected by thin strips of gallery forest around the margins of the dam and along a small stream draining the southern section. A canopy height of 15–25 m is dominated by *Olea africana* and *Podocarpus falcatus*, with other prominent species including *Combretum* sp., *Diospyros abyssinica* and *Teclea nobilis* (Gichora 2003). The forest obscures moderate to steep valley sides and a humid streamside understorey, characterized by abundant creepers and vines.

Katimok Forest is the largest extant forest in the hills, covering *c.* 1950 ha at 2000–2300 m. It is floristically also the most diverse, with emergents reaching 40 m in places, and grows on the most level ground, the two other sites being moderately to very steep. Prominent canopy trees include *Olea africana*, *Podocarpus falcatus*, *Polyscias fulva*, *Prunus africana*, *Syzygium guineense*, *Teclea nobilis* and *Vitex keniensis*.

Saimo Forest is the highest and northernmost forest, covering *c.* 750 ha at 2200–2493 m. The forest grows mostly on very steep slopes and in ravines, but is floristically diverse in places, where the canopy height may exceed 30 m. On the leeward eastern slopes, the forest is drier with less high trees, and comprises primarily dense stands of *Podocarpus falcatus* on the highest ridges.

Methods

Our field data were collected between 2011 and 2018 and comprise species lists from 18 visits during March, June, November and December. These informal surveys lasted up to seven hours each (mean *c.* 2 h), for a cumulative total of 34.2 h of survey effort (Table 1). Observations were made with 8× and 10× binoculars, while digital photography, audio recording and playback was used opportunistically.

During the course of our visits we also monitored forest species occurring outside of the focal forest reserves. These observations, mostly from lightly treed farmland,

small woodlots and remnant forest along streams, provide some contrast to those made in the forest reserves. In particular, we recorded species casually at 1950 m near the town of Bartolimo and in the vicinity of Kabarnet.

To supplement our own observations, we also include and reference where possible any previously published records in short notes, papers or rare bird reviews, as well as a number of records and comments kindly forwarded to us by T. Stevenson, who has visited the area regularly since the 1980s.

Table 1. Survey effort and characteristics for each of the areas studied.

Forest Unit	Area (ha)	% indigenous forest	Elevation (m)	number of visits	number of survey mins	number of survey mins / hectare forest
Kirendich	680	85	1800–2150	6	365	0.54
Katimok	1950	80	2000–2300	9	1120	0.57
Saimo	750	85	2200–2500	3	565	0.75
Farmland (Bartolimo)	NA	10	1800–2000	NA	310	NA

Results

We recorded 59 species of forest-dependent birds. Including a further six species reported from the area by other observers, 65 species, comprising 33 families, are known from the Tugen Hills forests (Appendix 1). Forty-two percent (27 out of 65) consists of forest specialists, the remainder being forest generalists (Bennun *et al.* 1996). The avifauna is primarily montane, with 23 species being representative of the Afrotropical Highlands biome (Bennun & Njoroge 1999). A further three are representative of the Guinea-Congo forests, indicating a slight western affinity. To compliment this diversity, two Palaeacrtic migrants also make use of the forest habitat on the hills during northern winter months. Taxonomy and nomenclature follow the fourth edition of the *Checklist of the Birds of Kenya* (EANHS 2009).

Twenty-five species were recorded outside of the three protected forests surveyed, in wooded agriculture, small woodlots and remnant thicket along streams. However, only 24% of these (six out of 25) were forest specialists, compared with 40% (21 out of 52) at Katimok, 33% (12 out of 36) at Kirendich, and 31% (11 out of 36) at Saimo, highlighting the importance of reserves for species of the forest interior in particular. It should also be noted that Katimok Forest supports a significantly higher number of forest-dependent birds than the other two forests, probably due to its larger size.

None of the species we recorded are globally threatened, and all are represented by sizeable populations elsewhere in western Kenya (Zimmerman *et al.* 1996). However, three species, Crowned Eagle *Stephanoaetus coronatus*, Least Honeyguide *Indicator exilis* and Purple-throated Cuckooshrike *Campephaga quiscalina*, are considered threatened at a regional level (Bennun & Njoroge 1999) and the Tugen Hills forest may be considered important for their conservation. For some species we recorded, the Tugen Hills represents a new site, filling a gap in their western Kenya distributions. Red-fronted Parrot *Poicephalus gulielmi*, Plain Greenbul *Andropadus curvirostrtis* and Red-headed Bluebill *Spermophaga ruficapilla* in particular were unexpected.

Notes on selected species

Crested Guineafowl *Guttera pucherani*

Scaly Francolin *Francolinus squamatus*

Both appear to be rare in the hills today with only single records of each. This appears to reflect a genuine decline, in the case of the guineafowl at least, as it was thought to be fairly common in the 1980s and 1990s (T. Stevenson *in litt.* 2019). We observed local villagers in the forests with various pieces of hunting equipment, and this pressure may be the reason for their scarcity. We also noted a similarly low abundance of small mammals and monkeys.

Red-fronted Parrot *Poicephalus gulielmi*

Only one observation, of six together in Katimok Forest at 2300 m on 14 June 2014. This appears to be the only record for the Tugen Hills, where it may only occur as a sporadic wanderer when *Podocarpus* are in fruit.

Moustached Tinkerbird *Pogoniulus leucomystax*

Recorded by T. Stevenson (*in litt.* 2019) as common, but we have not encountered it ourselves. Possibly they were not vocal at the times of year we visited.

Yellow-billed Barbet *Trachylaemus purpuratus*

A scarce resident at most. We found singles in the forest interior on only two occasions, at Katimok at 2300 m and at Kirendich at 2000 m. One foraged on small fruits in the lower midstorey.

Least Honeyguide *Indicator exilis*

Presumably a rare and local resident. We found two counter-singing birds in the forest interior of Kirendich at 1850 m in December 2017, one of which was sound-recorded and photographed. This record represents an eastward range extension of *c.* 90 km from the nearest site of occurrence at North Nandi Forest (Schifter & Cunningham van-Someren 1998, Zimmerman *et al.* 1996).

Fine-banded Woodpecker *Campethera tullbergi*

Apparently a rare resident, possibly confined to the most humid areas of forest in the hills. We have just one record, of a pair foraging together on small branches in the midstorey of Kirendich Forest in March 2012 at 1850 m. Observations by others up to around 2005 suggest it may have been more abundant in the past (T. Stevenson *in litt.* 2019).

Plain Greenbul *Andropadus curvirostris*

Seen once in vine tangles at 2250 m in Katimok Forest. The bird approached the observers in response to playback of the species' song from Kakamega, allowing reasonable views. Features noted include the narrow and fine bill, a yellow wash across the belly, and a soft rattled call characteristic of the species. Plain Greenbul has also been reported from *c.* 2300 m on the nearby Elgeyu Escarpment (Turner 1993) but otherwise, has a patchy distribution in western Kenya (Zimmerman *et al.* 1996) and was not expected.

Joyful Greenbul *Chlorocichla laetissima*
Not observed by us, but reported from Katimok (Kabartonjo) Forest by Mann (1980). Presumably local and rare, and possibly confined to the most humid sites. Future observers should seek to confirm its continuing presence in the Tugen Hills.

Abyssinian Ground Thrush *Zoothera piaggiae*
Not observed by us; a single bird seen around 2000 m in Katimok Forest by T. Stevson (*in litt.* 2019) is the only record. Presumably very local and rare.

Green-backed Twinspot *Mandingoa nitidula*
Found only in Kirendich Forest, with November observations of a single male and a single female at 2000 m and 1850 m respectively. On both occasions the birds were found near water, at a spring on a steep hillside and next to a streambed. In the immediate region, it has also been reported from *c.* 1400 m at the nearby Kimwarer mine in the southern Kerio Valley in August and December (Wilson & Wilson 1994).

Red-headed Bluebill *Spermophaga ruficapilla*
Local, favouring thick understorey and tangles in the vicinity of streams. We observed it on four occasions, in Kirendich at 1850 m and in Katimok at 2250 m (Fig.2). The species is generally scarce and local in western Kenya, the nearest site being Chemorogok/Lembus Forest (Jackson 1996), 35 km to the south.

Thick-billed Seedeater *Crithagra burtoni*
Uncommon in the hills, though we observed it at 1850–2400 m in Kirendich and Saimo as well as in wooded farmland at Bartolimo. Birds in the western Kenya highlands have been variably referred to *C. b. tanganjicae* (Zimmerman *et al.* 1996) or *C. b. kilimensis* (Fry & Keith 2004), but the individuals we saw well appeared like neither of these races. While Fry & Keith (2004) illustrate *kilimensis* with a white patch on the forehead, Zimmerman *et al.* (1996) state this feature to be absent in *kilimensis* (as *tanganjicae* is described by Fry & Keith). Regardless of which account is correct, birds in the Tugen Hills do not have a white forehead patch but a bold white supercilium extending behind the eye and a bold white patch at the base of the lower mandible (Fig. 3). The underparts may also be slightly paler than those of birds elsewhere in the west Kenya highlands. These birds deserve further study to assess whether these differences are consistent across the population.

Figure 2. Red-headed Bluebill *Spermophaga ruficapilla*, Katimok Forest, Tugen Hills, Kenya, 15 Jun 2014 (photo: S. Carter).

Figure 3. Racially unassigned Thick-billed Seedeater *Crithagra burtoni*, Saimo, Tugen Hills, Kenya, 5 Nov 2018 (photo: J. Fidorra).

Discussion

In supporting 65 species of forest-dependent birds, the well-preserved forests of the Tugen Hills provide a refuge for 28% of the 230 forest-dependent birds occurring in Kenya (Bennun *et al.* 1996). Of the three forest units surveyed, Katimok Forest is perhaps the most important with both the highest number of species, as well as the highest proportion of forest specialists, requiring extensive forest interior habitat to survive. The richness of forest birds in well treed farmland and along streams outside of the forest reserves was lower, as anticipated. However, it seems probable that to an extent, these areas function as corridors for at least some species, permitting dispersal and gene flow between areas of protected forest.

Compared with other forests in western Kenya that are roughly equivalent in size, the number of forest-dependent species in the Tugen Hills is similar. Surveys in Nyakweri Forest (1500 ha), 210 km to the south of the Tugen Hills, and at a slightly lower altitude, found 60 forest-dependent species (Bradley & Davis 2019). Likewise, in the nearby Gwassi Hills (<2000 ha), at similar elevations to the Tugen Hills, 50 species of forest-dependent species have been recorded (Bradley *et al.* 2015, Bradley 2018). Meanwhile, in particularly diverse forests in western Kenya, species richness may be considerably higher given only a slightly larger forest area. Schifter & Cunningham van-Someren (1998) found as many as 92 forest-dependent species in the North Nandi Forest (10500 ha), which may also be indicative of a slightly higher rainfall regime in that area. In the Tugen Hills, our surveys nonetheless confirm the presence of a diverse forest avifauna, in particular at Katimok Forest, and further surveys may reveal additional species as yet undetected.

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James Bradley
7961 East Saanich Rd, Sannichton, British Columbia, V8M 1T4, Canada
Email: james_bradley@ymail.com

Simon Carter
202 Edgemont St. South, Hamilton, Ontario, L8K 2H9 Canada. Email: simonchiz@gmail.com

David Guarnieri
91 Lake Avenue, Metuchen, NJ 08840 USA. Email: dvguarnieri@mac. com

Jason Fidorra
6308 Westmorland Lane, Pasco, WA 99301 USA. Email: jfidorra@gmail.com

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Appendix 1. Forest-dependent species recorded in the Tugen Hills forests. FF = forest specialist; F = forest generalist; [1] = Afrotropical Highlands biome; [2] = Congo-Guinea Forests biome. A general measure of abundance is provided using the terms: common (to be expected on most visits), uncommon (to be expected on ~20–40% of visits), and rare (recorded on fewer than ~20% of visits). Taxonomy and nomenclature follow the *Checklist of the Birds of Kenya* (EANHS 2009).

Species	forest dependence	Kirendich	Katimok	Saimo	non-gazetted	elevation range (m)	general abundance	comments
Crested Guineafowl *Guttera pucherani*	FF					unknown	Rare	7–8 birds in the Tugen Hills on 19 May 1983 (EABR 1983)
Scaly Francolin *Francolinus squamatus*	F				x	1950	Rare	voice only
African Hobby *Falco cuvieri*	F				x	1970	Rare	a pair observed in wooded agriculture at Bartolimo in Nov
African Goshawk *Accipiter tachiro*	F	x		x	x	2050–2300	Common	
Crowned Eagle *Stephanoaetus coronatus*	FF		x			2200	Rare	one adult observed only but also seen here by T. Stevenson (pers. comm.)
Eastern Bronze-naped Pigeon *Columba delegorguei*	FF	x	x			2000–2300	Uncommon	
Lemon Dove *Aplopelia larvata*	FF		x	x	x	1950–2400	Uncommon	
Tambourine Dove *Turtur tympanistria*	F	x	x	x	x	1800–2350	Common	
Red-fronted Parrot *Poicephalus gulielmi*	FF		x			2260	Rare	
Hartlaub's Turaco *Tauraco hartlaubi*[1]	FF	x	x	x	x	1850–2500	Common	
Ross's Turaco *Musophaga rossae*	F	x	x	x	x	1800–2400	Common	
Red-chested Cuckoo *Cuculus solitarius*	F	x	x	x		1850–2350	Uncommon	
African Emerald Cuckoo *Chrysococcyx cupreus*	F		x	x	x	1950–2400	Common	
African Wood Owl *Strix woodfordii*	F				x	1950	Rare	voice only
Montane Nightjar *Caprimulgus poliocephalus*[1]	F				x	1950	Rare	voice only
Narina Trogon *Apaloderma narina*	F	x	x	x		2000–2400	Common	
Cinnamon-chested Bee-eater *Merops oreobates*[1]	F	x	x	x	x	1950–2350	Common	
Black-and-white-casqued Hornbill *Bycanistes subcylindricus*[2]	F	x	x	x	x	1800–2400	Common	occupied nest in Nov
Grey-throated Barbet *Gymnobucco bonapartei*	F		x	x		2200–2400	Common	occupied nest in Mar
Moustached Tinkerbird *Pogoniulus leucomystax*[1]	FF		x			unknown	Uncommon	observed here by T. Stevenson (pers. comm.)
Yellow-rumped Tinkerbird *Pogoniulus bilineatus*	F	x	x	x	x	1850–2450	Common	
Yellow-billed Barbet *Trachylaemus purpuratus*[2]	F	x	x			2000–2300	Uncommon	

Species	forest dependence	Kirendich	Katimok	Saimo	non-gazetted	elevation range (m)	general abundance	comments
Least Honeyguide *Indicator exilis*	FF	x				1850	Rare	
Fine-banded Woodpecker *Campethera tullbergi*[1]	FF	x				1850	Rare	possibly declining
Black-throated Wattle-eye *Platysteira peltata*	F	x	x	x		1800–2400	Common	fledged young in Mar and Nov
Black-fronted Bushshrike *Chlorophoneus nigrifrons*	FF		x	x		2200–2400	Common	immature in Nov; most abundant at Katimok
Northern Puffback *Dryoscopus gambensis*	F	x	x	x	x	1850–2350	Common	fledged young in Jun
Grey Cuckooshrike *Coracina caesia*[1]	FF	x	x	x		2000–2500	Common	most abundant at Saimo
Purple-throated Cuckooshrike *Campephaga quiscalina*	FF		x			2250	Rare	
White-tailed Crested Flycatcher *Elminia albonotata*[1]	FF		x	x		2200–2350	Uncommon	
White-chinned Prinia *Schistolais leucopogon*	F					unknown	Uncommon	reported from the Tugen Hills on 19 May 1983 (EABR 1983)
Black-collared Apalis *Apalis pulchra*[1]	F		x	x		2200–2400	Common	
Chestnut-throated Apalis *Apalis porphyrolaema*[1]	F	x	x	x	x	2000–2500	Common	
Grey Apalis *Apalis cinerea*	F	x	x	x		1850–2400	Common	
Mountain Greenbul *Andropadus nigriceps*[1]	FF		x			2250	Rare	
Plain Greenbul *Andropadus curvirostris*[2]	FF		x			2250	Rare	
Yellow-whiskered Greenbul *Andropadus latirostris*	F	x	x	x	x	1800–2450	Common	fledged young in Mar
Slender-billed Greenbul *Andropadus gracilirostris*	FF	x	x	x	x	1850–2500	Common	
Joyful Greenbul *Chlorocichla laetissima*[1]	F		x			unknown	Rare	reported from Katimok Forest by Mann (1980)
Cabanis's Greenbul *Phyllastrephus cabanisi*	FF	x	x	x	x	1850–2500	Common	
Brown Woodland Warbler *Phylloscopus umbrovirens*[1]	F	x	x	x		1850–2500	Common	
Common Chiffchaff *Phylloscopus collybita*	F					unknown	Rare	reported from the Tugen Hills on 16 Jan 1984 (EABR 1984)
White-browed Crombec *Sylvietta leucophrys*[1]	FF				x	1950	Uncommon	one singing bird in a forested ravine at Bartolimo. Also recorded by T. Stevenson (pers. comm.)
Blackcap *Sylvia atricapilla*	F		x	x		2200–2400	Uncommon	
African Hill Babbler *Pseudoalcippe abyssinica*[1]	FF	x	x	x		2200–2500	Common	
Stuhlmann's Starling *Poeoptera stuhlmanni*[1]	FF		x			2250	Rare	also reported from the Tugen Hills in Britton (1980) and Zimmerman *et al.* (1996)

Species	forest dependence	Kirendich	Katimok	Saimo	non-gazetted	elevation range (m)	general abundance	comments
Sharpe's Starling *Pholia sharpii*[1]	FF		x			2250	Uncommon	also reported from the Tugen Hills on 19 May 1983 (EABR 1983)
Abyssinian Ground Thrush *Zoothera piaggiae*[1]	FF		x			unknown	Rare	observed here by T. Stevenson (pers. comm.)
Olive Thrush *Turdus olivaceus*	F	x	x	x		2000–2400	Uncommon	
White-starred Robin *Pogonocichla stellata*[1]	F		x			2250–2300	Uncommon	
Red-capped Robin Chat *Cossypha natalensis*	F	x	x	x		1850–2400	Uncommon	
White-eyed Slaty Flycatcher *Melaenornis fischeri*[1]	F	x	x	x	x	1850–2400	Common	nest building in Nov
African Dusky Flycatcher *Muscicapa adusta*	F	x	x	x	x	1850–2500	Common	
Collared Sunbird *Hedydipna collaris*	F	x	x	x	x	1800–2500	Common	
Green-headed Sunbird *Cyanomitra verticalis*	F		x			2250	Uncommon	
Olive Sunbird *Cyanomitra olivacea*	FF	x	x			1850–2300	Uncommon	
Northern Double-collared Sunbird *Cinnyris reichenowi*[1]	F	x	x	x	x	1850–2500	Common	
Black-billed Weaver *Ploceus melanogaster*[1]	FF	x	x	x		1850–2350	Uncommon	nest building in Nov
Brown-capped Weaver *Ploceus insignis*[1]	FF		x	x		2200–2350	Uncommon	
Grey-headed Negrofinch *Nigrita canicapillus*	F	x	x	x		2050–2500	Uncommon	
Green-backed Twinspot *Mandingoa nitidula*	FF	x				1850–2000	Rare	
Abyssinian Crimsonwing *Cryptospiza salvadorii*[1]	F		x			2250	Uncommon	also reported from the Tugen Hills on 19 May 1983 (EABR 1983)
Red-headed Bluebill *Spermophaga ruficapilla*	F	x	x			1850–2250	Uncommon	
Mountain Wagtail *Motacilla clara*	F	x	x		x	1800–2250	Uncommon	occupied nest in Nov
Thick-billed Seedeater *Crithagra burtoni*[1]	FF	x		x	x	1850–2450	Uncommon	

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Bird species richness in the montane evergreen forests of the Udzungwa Mountains, Tanzania

Flemming P. Jensen, Lars Dinesen, Louis A. Hansen, David C. Moyer and Elia A. Mulungu

Summary

Species richness and relative abundance of montane forest birds in the Udzungwa Mountains are presented for the 11 forests larger than 1 km^2. A high positive correlation between the number of montane bird species and the size of the forest is found with the highest species richness recorded in the largest forest. A few small (<5 km^2) forest fragments also support a high richness of forest birds. Their isolation from larger forest tracts is probably relatively recent (within the last 100–200 years) and their high bird species numbers may be partly due to delayed extirpations. Twenty-three restricted range montane forest species were recorded, and many of these were widespread in the Udzungwas. The largest populations of White-winged Apalis *Apalis chariessa,* Dapple-throat *Arcanator orostruthus,* Iringa Akalat *Sheppardia lowei* and Usambara Weaver *Ploceus nicolli* are most likely in Udzungwa forests.

Keywords Tanzania, Udzungwa Mountains, montane forest birds, distribution, abundance, extinction debt

Introduction

The Udzungwa Mountains are part of the Eastern Arc Mountain chain that rises from the coastal plains of eastern Tanzania and southeastern Kenya and is comprised of 13 individual blocks of ancient crystalline rocks covered with evergreen forest, woodland and grassland. The evergreen forests of the individual mountain blocks are isolated, and the Eastern Arc is, in effect, an archipelago of moist forested islands in a 'sea' of drier vegetation (Wasser & Lovett 1993). Because of its species richness and an extraordinary high concentration of endemic flora and fauna, the Eastern Arc is considered a global conservation hotspot (Myers *et al.* 2000). Among these hotspots, the Udzungwas consistently rank highest in terms of diversity and irreplaceability (Dinesen *et al.* 2001, Burgess *et al.* 2007, Saout *et al.* 2013).

Earlier analyses of forest birds have mainly compared richness, endemism and conservation priorities in the individual Eastern Arc Mountain blocks, or considered local distributions within the highlands for a subset of forest birds (e.g., Stuart *et al.* 1993, Dinesen 1998, Burgess *et al.* 2007). In this study, the distribution of the full set of montane Udzungwa forest birds is presented for the first time, reviewing the species assembly for each tract of forest in the Udzungwa Mountains. Following Romdal & Rahbek (2009) we recognize a boundary at *c.* 1200 m between a lowland and montane forest bird community in the Udzungwas (based on data from Mwanihana Forest). The present paper focuses on montane forest birds only, i.e. species breeding regularly in forest above 1200 m.

Study area

The Udzungwa Mountains cover an area of about 6500 km^2 of which almost 400 km^2 is montane forest. The mountains rise steeply from the flat Kilombero floodplain along their southeastern edge, at 250–300 m to over 2500 m. The east- and southeast-facing slopes are heavily forested, with Mwanihana and Uzungwa Scarp forests (Fig. 1) having continuous forest cover from 300 m up to about 2100 m. West of the escarpment there is a plateau of rolling hills covered in grassland, wooded grassland, woodland, and strips of riverine forest. This declines from 2000 m down to 1200 m towards the Great Ruaha River and the central plateau of Tanzania. On higher ground in the northwest there are a series of high ridges and mountains covered in forests (Ulongambi, Kisinga-Rugaro, Ndundulu-Luhombero, Nyumbanitu and Iyondo). The land surrounding these forest fragments is covered in farmland, plantation forestry and villages.

Most forest in the Udzungwas is montane, although Uzungwa Scarp, Mwanihana and Iyondo forests also include small areas of evergreen forest below 1200 m. Matundu and Nyanganje forests (Fig. 1) consist entirely of lowland forest and are not included in this study.

Most evergreen forests in Tanzania are designated Forest Reserves. However, in 1992 Mwanihana, the eastern half of Ndundulu-Luhombero and Iwonde forests, were upgraded in protection status and included in the Udzungwa Mountains National Park (Fig. 1) and in 2007 the western part of Ndundulu-Luhombero forest, Nyumbanitu, Ukami and Iyondo (and a number of lowland forests) were combined to form the West Kilombero Nature Reserve. In 2012, Uzungwa Scarp forest was upgraded to the Uzungwa Scarp Nature Reserve. Ulongambi, Kisinga-Rugaro, Kiranzi-Kitungulu and Kitemele remain Forest Reserves.

The Forest Reserves aim to protect the forests, but also allow for regulated utilization by local communities of forest products and services including medicinal plants, fungi, honey, and some timber and wild animals. Nature Reserves have a higher level of protection than Forest Reserves in that these are for non-extractive use only and are gazetted with an aim to attract tourism. The Udzungwa Mountains National Park has the highest level of protection and funding. National Parks are strict preservation areas and the only uses allowed are recreational and photographic tourism.

Until the 1970s there were scattered villages between some of the forests inside the National Park and Kilombero Nature Reserve, but today the grasslands and woodlands that separates these forests are uninhabited.

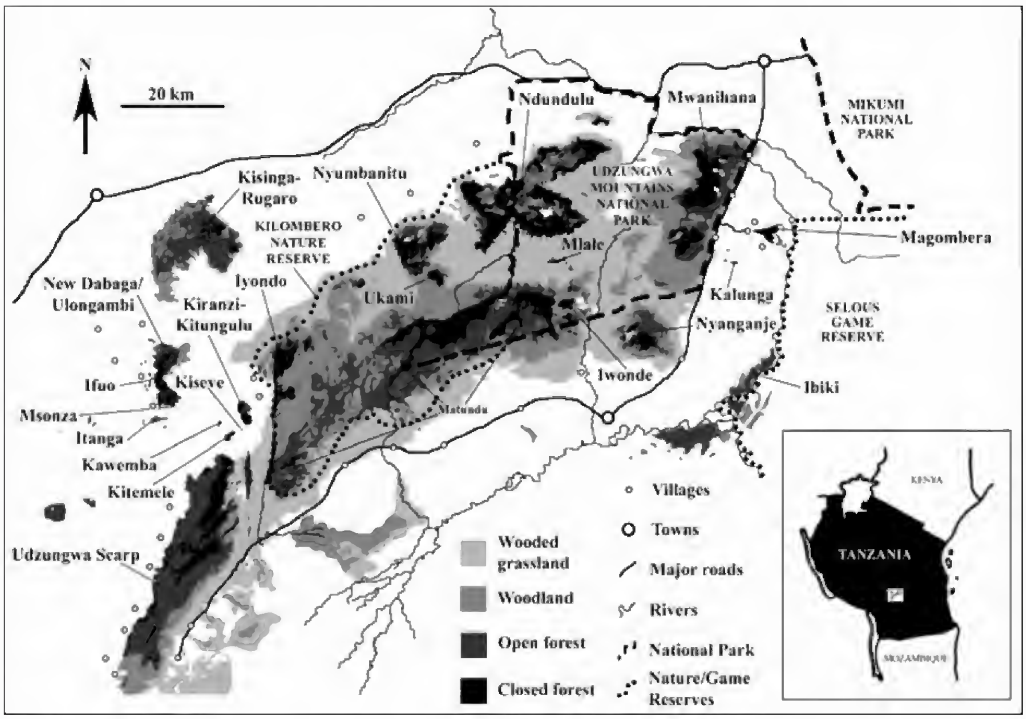

Figure 1. Montane forests in the Udzungwa Mountains based on Landsat imagery (from Marshall *et al.* 2009). Areas of unclassified habitat are mostly agriculture and bushland. Note that Matundu and Nyanganje are lowland forests and not included in this study.

Materials and methods

Bird data were mainly sourced from our own observations spanning nearly four decades of field work from 1981 to 2019 (Table 1). Extensive field work was carried out in all the larger Udzungwa forests (Table 1). This involved bird observations collected from field sites in the various forests. In the larger forests we sampled at different altitudes (typically 1400 and 1700 m) to ensure coverage of forest birds with limited altitudinal ranges. From the study sites we usually followed animal paths in all directions making visual and aural bird observations. Mist netting and/or song play-back were also used to detect and document individual bird species.

We define a 'field day' as one full day of bird recording (or other types of bird field work such as species or group specific data collection) by one person. This typically includes observation and listening from dawn to mid-day and again in the late afternoon. Only four or five field days were spent in the small forest fragments of Kiranzi-Kitungulu, Kitemele and Iwonde (Table 1), and it is therefore likely that our species lists from these areas are incomplete. In addition to our own data, we have included all other published and unpublished records that we have been able to trace (see References).

The size of the Udzungwa forests has been estimated by Dinesen *et al.* (2001) using 1:50 000 maps; subsequently Marshall *et al.* (2009) estimated the size of closed-canopy forests using satellite imagery and further verifying canopy cover for about 50% of the forest area from ground survey and aerial overflights. We calculated estimates of montane (i.e. >1200 m altitude) closed-canopy forest coverage from the closed-can-

opy estimates in Marshall *et al.* (2009) by drawing polygons in Google Earth Pro containing closed-forests areas below 1200 m in Uzungwa Scarp, Mwanihana and Iyondo forests and subtracted these areas from the total. We limit the study to montane forests we estimate as having an area over 1 km^2.

The species richness against forest area relationship was calculated using a semi-logarithmic graph where area is logged, and the number of species is arithmetic, using the formula $S = \log(cA^z) = \log(c) + z \log(A)$ where S is the number of species, A is the area of the forest, c is a constant which depends on the unit used for area measurement and Z is the slope of the line.

Results

We found that large areas (>15 km^2) of montane forest are restricted to six forest tracts, and that there are five other montane forests larger than 1 km^2 (Table 1).

Table 1 also lists the number of montane forest bird species and restricted range species recorded in the 11 forest areas larger than 1 km^2. For the purpose of this paper we define restricted range montane forest species as birds that are limited in range to Eastern Arc forests, and in some cases also to one or two forest areas outside the Eastern Arc Mountains, typically in Tanzania and/or mountain patches in northern Mozambique (see also Stattersfield *et al.* 1998). The full list of forest species in each forest is provided in Appendix 1, including an indication of the abundance of the species in the larger forests. Bird names and taxonomy follow Gill & Donsker (2020) IOC World Bird List (v 10.1).

Table 1. The Udzungwa forests with more than 1 km^2 of closed-canopy montane forest, in descending order of size. Number of field survey days spent in the various forests (one field survey day is one day of bird recording by one person), number of montane forest bird species recorded and number of restricted range species. Forests shaded with grey are not well surveyed and further field work might add more species in these forests (see text). [1]We consider records of Moreau's Warbler *Spectomycter winifredae* from Mwanihana Forest mentioned first in Stuart *et al.* (1987) and repeated in Jensen & Brøgger-Jensen (1992) an error. [2]Restricted range montane forest species recorded in the Udzungwas are shown in bold in Appendix 1.

Forest	Area of montane closed-canopy forest (km^2)	Number of field survey days	Number of montane forest species[1]	Restricted range montane forest species[2]
Ndundulu-Luhombero	161.1	422	70	25
Uzungwa Scarp	c. 75	164	69	24
Mwanihana	69.4	139	67	22
Nyumbanitu	27.9	118	69	24
Iyondo	c. 23	23	61	19
Ulongambi	16.0	12	57	15
Kisinga-Rugaro	9.4	44	55	13
Ukami	5.0	82	58	20
Kiranzi-Kitungulu	4.4	5	40	12
Kitemele	1.2	5	31	10
Iwonde	1.1	4	8	5
Total forest area	394			

Figure 2. shows the species richness against (log) forest area. The coefficient of determination R^2 was calculated to 0.78. This suggest a high positive correlation between the number of montane bird species and the size of the forest.

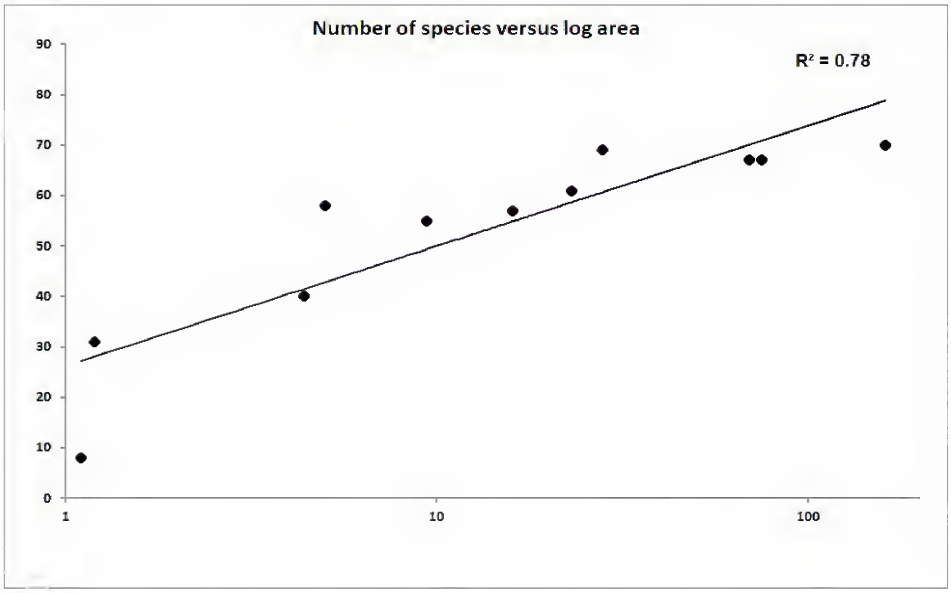

Figure 2. The species richness (numbers) against forest area relationship (km²) using a semi-logarithmic scale.

Discussion

Most of the montane forest birds are widespread in the Udzungwas and are recorded from all the well-surveyed forests (Appendix 1). Notable exceptions are Pale-breasted Illadopsis *Illadopsis rufipennis,* and Iringa Akalat *Sheppardia lowei*, which have not been recorded from Mwanihana forest. This is one of the best surveyed forests and prime habitat for both species appears to be widespread. The lack of records of these two forest dwellers is particularly unexpected because both are relatively common and widespread in other parts of the Udzungwas. It should be noted that unpublished genetic studies by R. Bowie suggests that there are "marked genetic differences" between the highland populations in the Udzungwa and Rubeho Mts. and the other populations of Pale-breasted Illadopsis in Tanzania (Fjeldså *et al.* 2010).

The majority of restricted range species occur in many of the larger forests (Appendix 1). Several of these are very rare and local in all other parts of their range. White-winged Apalis *Apalis chariessa* was found in eight Udzungwa forests including all the four larger ones (with >15 km² forest cover) (Appendix 1). Elsewhere, this species has only tiny populations left in southern Malawi (Dowset-Lamaire & Dowset 2006), northern Mozambique (Dowset-Lamaire 2008) and perhaps also in the Uluguru Mountains in Tanzania (Svendsen & Hansen 1995). Dapple-throat *Arcanator orostruthus* was found in seven forest patches (Appendix 1) where it generally is a low-density species, but locally can be relatively common (Fig. 3). Outside the Udzungwas, this species occurs in very small populations on Mount Namuli and Mabu in northern Mozambique (Dowsett-Lemaire 2008, Dowsett-Lemaire & Dowsett 2009) and in the East Usambara Mountains in northeastern Tanzania (Borghesio *et al.* 2008). Iringa Akalat *Sheppardia lowei* was recorded from five Udzungwa forests (Fig. 4). Elsewhere it is restricted to a few small forests in south Tanzania (Britton 1980) including several of the small forest patches around Njombe (pers. obs.). Us-

ambara Weaver *Ploceus nicolli* is a low-density species in the Udzungwa Mountains, but has been recorded from seven forests. Outside the Udzungwas it is known only from a few small forest patches in the East and West Usambara Mountains (Seddon *et al.* 1999) and in the Uluguru Mountains from two specimens collected in 1952 and 1961, and a single observation from 1981 (Stuart & Jensen 1981). Considering the large distribution these four species have in the Udzungwas, these mountains most likely support their largest populations.

Figure 3. The largest populations of Dapple-throat *Arcanator orostruthus* is most likely in Udzungwa forests (photo Flemming P. Jensen).

Figure 4. Iringa Akalat *Sheppardia lowei* occurs in only five of the Udzungwa forests (photo: Flemming P. Jensen).

We found a strong linear relationship between the number of montane species and the size of the forests (Fig. 2). This is to be expected as large forests generally will offer a wider range of habitats, and larger populations have less chance of extirpation. Larger areas (forests) also have a higher chance of receiving colonists, but movements of forest birds between forest tracts is probably not an important factor in the Udzungwas. Erratic and inter-montane movements have been documented in a small number of the montane forest species (Dowsett-Lemaire 1989, pers. obs.) and some species are known to carry out considerable seasonal movements to lower altitudes in the non-breeding season (Jensen & Brøgger-Jensen 1992), but the majority are restricted to forest interior with limited ability to disperse outside of their core habitat types (Newmark 1991).

Even a few of the small (1.2–4.4 km^2) forest fragments support a high richness of forest birds. This include the Forest Reserves Kiranzi-Kitungulu and Kitemele. The isolation of these forest fragments is probably relatively recent (within the last 100–200 years) and their high bird species numbers may be partly due to delayed extirpations constituting an extinction debt (*sensu* Tilman *et al.* 1994, Hylander and Ehrlén 2013).

Avoiding these extirpations by reconnecting smaller Forest Reserves with larger forest areas would be a challenge since the land surrounding these fragments is now mostly farmland and settlements.

Long-term presence of edaphic montane grasslands on the Eastern Arc Mountains is well documented (Finch & Marchant 2010). However, large areas of secondary grassland separating many Udzungwa forest patches in the National Park and Nature Reserves today are most likely a result of relatively recent clearing and burning of forest by humans for agricultural purposes. Although such activities have taken place since the arrival of bantu agriculturalists in the area several thousand years ago, most of the forest loss and isolation of forest patches has occurred within the last 200 years (Schmidt 1989, Newmark 1998).

The relocation of villages from the Udzungwa escarpment areas in 1974 and the designation of Udzungwa Mountains National Park in the 1992 has stopped most of the agricultural activities in the grasslands between forest patches and some regeneration of trees and shrubs in these areas has been observed by us. However, annual bushfires in many of these areas inhibit natural regeneration of forest connections between forest tracts.

Although many species have fairly small territory sizes (Moyer 1993) and are able to maintain viable populations in small forest patches for a considerable time, the risk of extinction of isolated populations does increase with decreasing forest area due to stochastic events, and some of these populations are eventually doomed to extinction (Newmark *et al.* 2017). Suppression of the annual burns should therefore be given priority in order for the forests to expand and reconnect and thereby create more forest habitat for increasing populations and at the same time restoring the gene flow of the montane forest birds.

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Flemming P. Jensen
Vimmelskaftet 8, DK-4791 Borre, Denmark. Email: fpaghj@gmail.com

Lars Dinesen
Center for Macroecology, Evolution and Climate, Globe Institute, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen, Denmark

Louis André Hansen
Center for Macroecology, Evolution and Climate, Globe Institute, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen, Denmark

David C. Moyer
Field Museum of Natural History, 1400 S Lake Shore Drive, Chicago, IL 60605, USA, and P.O. Box 691, Iringa, Tanzania

Elia A. Mulungu
P.O. Box 934, Iringa, Tanzania

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Appendix 1. Distribution and abundance of closed-canopy montane forest birds in forests tracts of Udzungwa Mountains. Areas shaded with grey are not well surveyed and further field work will add more species. Species in bold are endemic or restricted range species (see text for explanation). Definition of abundance: xx = common in right habitat(s), x = rare/low density species, O = recorded, but status not evaluated due to limited field effort.

	Ndundulu - Luhombero	Uzungwa Scarp	Mwanihana	Nyumbanitu	Iyondo	Ulong'ambi	Kising'a-Rugaro	Ukami	Kiranzi-Kitungulu	Iwonde	Kitemele
Udzungwa Forest Partridge *Xenoperdix udzungwensis*	x			x							
African Goshawk *Accipiter tachiro*	x	x	x	x	x	x	x	x			
Mountain Buzzard *Buteo oreophilus*	x	x	x	x	x	x	x	x			
Cassin's Hawk-eagle *Aquila africana*	x	x	x	x	x					O	
Crowned Eagle *Stephanoaetus coronatus*	x	x	x	x	x	x	x	x	O		
Africa Olive Pigeon *Columba arquatrix*	xx	xx	xx	xx	xx	xx	xx		O		
Eastern bronze-naped Pigeon *Columba delegorguei*	xx	xx	xx	xx	xx	xx	xx	xx	O		
Lemon Dove *Columba larvata*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Livingstone's Turaco *Tauraco livingstonii*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Barred long-tailed Cuckoo *Cercococcyx montanus*	xx	xx	xx	xx	xx	xx	xx	xx	O		
African Wood Owl *Strix woodfordii*	x	x	x	x	x	x	x	x	O		O
Usambara Eagle Owl *Bubo vosseleri*	x	x	x					x		O	
Bar-tailed Trogon *Apaloderma vittatum*	xx	xx	xx	xx	xx	xx	xx	x	O		O
Silvery-cheeked Hornbill *Bycanistes brevis*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Green Barbet *Stactolaema olivacea*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Moustached Tinkerbird *Pogoniulus leucomystax*	xx	xx	xx	xx	xx	xx	xx	xx	O		
Yellow-rumped Tinkerbird *Pogoniulus bilineatus*	xx	xx	xx	xx	xx	xx	xx	xx			
Olive Woodpecker *Dendropicos griseocephalus*	x	x	x	x	x	x	x	x	O		O
African Broadbill *Smithornis capensis*	xx	xx	xx	xx	xx	xx	xx	xx	O		
Dark Batis *Batis crypta*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Black-fronted Bushshrike *Chlorophoneus nigrifrons*	xx	xx	xx	xx	xx		x	xx	O		O
Black-backed Puffback *Dryoscopus cubla*	x	x	x	x	x	x	x	x			
Fülleborn's Boubou *Laniarius fuelleborni*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Grey Cuckooshrike *Coracina caesia*	xx	xx	xx	x	xx	xx	xx	x	O		O
Green-headed Oriole *Oriolus chlorocephalus*	x	x	xx	x				xx			
Square-tailed Drongo *Dicrurus ludwigii*	xx	xx	xx	xx	xx	xx	xx	xx	O	O	O
African Paradise Flycatcher *Terpsiphone viridis*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
White-tailed Crested Flycatcher *Elminia albonotatus*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Shelley's Greenbul *Arizelocichla masukuensis*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Yellow-throated Greenbul *Arizelocichla chlorigula*	xx	xx	xx	xx	xx	xx	xx	xx			
Stripe-faced Greenbul *Arizelocichla striifacies*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Little Greenbul *Eurillas virens*	xx	xx	xx	xx	xx		xx	xx			
Placid Greenbul *Phyllastrephus placidus*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Yellow-streaked Greenbul *Phyllastrephus flavostriatus*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Yellow-throated Woodland Warbler *Phylloscopus ruficapilla*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Evergreen Forest Warbler *Bradypterus lopezi*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Bar-throated Apalis *Apalis thoracica*	xx	xx	xx	xx	xx	xx	xx	xx			
White-winged Apalis *Apalis chariessa*	x	x	x	x	x			x	O	O	

	Ndundulu - Luhombero	Uzungwa Scarp	Mwanihana	Nyumbanitu	Iyondo	Ulong'ambi	Kising'a-Rugaro	Ukami	Kiranzi-Kitungulu	Iwonde	Kitemele
Black-headed Apalis *Apalis melanocephala*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Chapin's Apalis *Apalis chapini*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Red-capped Forest Warbler *Artisornis metopias*	xx	xx	xx	x	xx	xx	xx	xx			
Pale-breasted Illadopsis *Illadopsis rufipennis*	xx	xx		x	xx	x		x			
African Hill Babbler *Pseudoalcippe abyssinica*	x	x	x	x	x	x	x				
Southern Yellow White-eye *Zosterops anderssoni*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Spot-throat *Modulatrix stictigula*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Dappled-throat *Arcanator orostruthus*	x	x	x	x	x			x	O		
Waller's Starling *Onychognathus walleri*	xx	xx	xx	xx	xx	xx	xx	xx			
Kenrick's Starling *Poeoptera kenricki*	x	x	x	x	x	x	x				
Orange Ground-thrush *Zoothera gurneyi*	x	xx	xx	x	x	x	x	x	O		
Abyssinian Thrush *Turdus abyssinicus*	xx	xx	xx	x	xx	xx	xx	xx			
White-chested Alethe *Chamaetylas fuelleborni*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
White-starred Robin *Pogonocichla stellata*	xx	xx	xx	xx	xx	xx	xx	xx			
Swynnerton's Robin *Swynnertonia swynnertoni*	x	x	x	x	x			x			
Sharpe's Akalat *Sheppardia sharpei*	xx	xx	xx	xx	xx	xx		xx			
Iringa Akalat *Sheppardia lowei*	x	x		x		x	x				
Olive-flanked Ground Robin *Cossypha anomala*	xx	xx	xx	xx		xx	xx				
African Dusky Flycatcher *Muscicapa adusta*	xx	xx	xx	xx	xx	xx	xx		O		O
Uluguru Violet-backed Sunbird *Anthreptes neglectus*	x	x	x	x	x	x		x		O	
Banded Green Sunbird *Anthreptes rubritorques*	x		x	x				x			
Collared Sunbird *Hedydipna collaris*	xx	xx	xx	xx	xx	xx	xx	xx			
Amani Sunbird Hedydipna pallidigaster	x		x					x			
Olive Sunbird *Cyanomitra olivacea*	xx	xx	xx	xx	xx	xx	xx	xx	O		O
Forest Double-collared Sunbird *Cinnyris fuelleborni*		xx		x	xx	xx	x	xx	O	O	O
Moreau's Sunbird *Cinnyris moreaui*	xx		xx	xx							
Rufous-winged Sunbird *Cinnyris rufipennis*	x	xx	xx	x	xx			x	O	O	O
Dark-backed Weaver *Ploceus bicolour*	xx	xx	xx	xx	xx	xx	xx	xx	O	O	O
Usambara Weaver *Ploceus nicolli*	x	x	x	x	x	x		x			
Green-backed Twinspot *Mandingoa nitidula*	x	x	x	x							
Red-faced Crimsonwing *Cryptospiza reichenovii*	xx	xx	xx	x	xx	x	x		O		O
Kipengere Seed-eater *Crithagra melanochrous*	x	x	x	x	x	x	x				
Oriole Finch *Linurgus olivaceus*	x	x	x	x		x	x				

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Waterbirds of the Murchison Falls–Albert Delta Wetland System, an important Ramsar site

Derek Pomeroy, Tim Dodman, Micheal Kibuule, Stephen Kigoolo, George Kaphu, Dianah Nalwanga, Michael Opige and David Ochanda

Summary

The Murchison Falls–Albert Delta Wetland System Ramsar Site, declared in 2006, consists of the River Nile from the Murchison Falls up to and including a small part of Lake Albert. Before entering the lake, the river splits into three main channels passing through an extensive delta supporting a papyrus swamp; the Ramsar site also includes the land within a kilometre of the river banks, north and south. Most is within Murchison Falls National Park. The river, including the channels through the papyrus, supports large numbers of waterbirds of many species. For a year, we undertook monthly waterbird counts along the channels through the delta swamps, and on the section of Lake Albert within the Ramsar site. Overall, we recorded 78 waterbird species and the site regularly supports three globally and another seven nationally threatened species, including Shoebill *Balaeniceps rex,* Grey Crowned Crane *Balearica regulorum* and Papyrus Gonolek *Laniarius mufumbiri.* The site is also important for large numbers of White-winged Black Terns *Chlidonias leucopterus* on passage. Most of the larger species, such as White-faced Whistling Duck *Dendrocygna viduata* and Long-tailed Cormorant *Microcarbo africanus* rarely, if ever breed in this area, instead their numbers drop at the times when they are expected to breed, apparently elsewhere. A number of pairs of Fish Eagles *Haliaeetus vocifer* breed, and there is a small colony of African Darters *Anhinga rufa.* The large numbers of easily-seen birds attract increasing numbers of visitors, adding to the site's value. Various industrial activities are planned within the watershed of this Ramsar Site, mainly associated with oil and gas, and our data are expected to provide baseline data for future monitoring of the site.

Keywords Murchison, Ramsar, waterbirds, Uganda

Introduction

The Murchison Falls-Albert Delta Wetland System (hereafter the Murchison Ramsar Site), an area of 173 km^2, was designated as a Ramsar site in 2006, together with eight other sites in Uganda (WMD/NU 2008). The Murchison Ramsar Site has several components, but the River Nile—locally known as the Victoria Nile—from the Murchison Falls to Lake Albert is its centre piece (Fig. 1). Along the river's final ten kilometres, before reaching the lake, there is a highly biodiverse and extensive area of papyrus *Cyperus papyrus* swamp, locally known as the Nile Delta (Kibuule *et al.* in prep). The Ramsar site then extends for up to 4 km into Lake Albert, where water

depths are mostly less than a metre. Finally, the site includes the land on both banks, up to one kilometre from the shores of the river and delta. Although mainly for watershed protection, these areas of land support nesting sites of African Fish Eagles *Haliaeetus vocifer*, whilst various species of plover, thick-knee and even Shoebill *Balaeniceps rex* are sometimes found on land adjacent to the river. On the north bank, this land is entirely within Murchison Falls National Park, as is most of the south bank. However, for some 18 km along the western part of the south bank, it is community land, extending to the lake port of Wanseko. Some of this land, and beyond to the boundary of the watershed, is cultivated with crops that include cassava and cotton, the remainder being mainly pastoral and heavily over-grazed. Thus run-off, both of soil and agricultural chemicals, may enter the river and the swamps.

Figure 1. Murchison Falls National Park, showing the extent of the Murchison Ramsar site, from the Falls to the Nile Delta, plus an adjacent few square kilometres of Lake Albert. The dotted lines are administrative boundaries.

The River Nile here varies in width, but averages about 200 m across, and it has several swampy islands within it. The channels through the delta are about 130 m wide on average. The delta is almost entirely covered in papyrus swamp, sometimes with a fringe of *Vossia cuspidata*, and also including a few areas of more open swamp. The section of the Ramsar site from the falls to the start of the delta comprises 24 waterbird count sites that have been counted by teams from NatureUganda for about 20 years, every January and July (the international waterbird count months).

Within the park, adjacent to the Ramsar site, as well as in areas south of the Nile, developments related to the oil and gas industry are beginning to take place, but only the place where the oil pipeline is planned to cross beneath the river is within the Ramsar site, so that most potential effects on the site would be indirect. In this paper we are concerned with the numbers and seasonality of the larger waterbirds of the Ramsar site, providing baseline data which will allow for future monitoring. We follow the Ramsar definition of waterbirds that covers all main non-passerine bird families whose members are largely ecologically dependent on wetlands (Wetlands International 2019), but we also include the aquatic kingfishers. Smaller passerine species, such as some warblers that also depend upon wetlands, are considered elsewhere (Kibuule *et al.*, in prep.).

As well as the conservation importance of this Ramsar site, boat trips on the River Nile are a major tourist activity for the tens of thousands who visit the park each year, amongst them increasing numbers for whom birds are a major interest. The majority of boat trips go upstream from Paraa to the Falls, but some also go downstream to the delta, particularly for those hoping to see Shoebill. Nomenclature follows Skeen & Pomeroy (2016).

Methods

We used two complementary methods to obtain an overview of the waterbirds. First, for the approximately 30 km of the Victoria Nile before it enters the delta, we have used the January and July total counts conducted by NatureUganda, in which all waterbirds were recorded. January and July 2018 were the two months for which we also had counts in the delta area, which involved sampling rather than total counts.

Within the Nile Delta, large waterbirds along the open channels of the river were counted by boat from a series of 20 point count sites, aimed mainly at the birds within the papyrus, with each point visited monthly from September 2017 to August 2018. Records were also kept of the distance from the observers to the point at which each large waterbird species was recorded in the channels, and for each species we noted the maximum distance at which it was seen, an estimate of its detectability. As an example, this distance was 250 m in each direction for the Squacco Heron *Ardeola ralloides* and on each side of the channel (where most were seen perched). So, for this species we surveyed a length of 500 m at each of the 20 point count sites, a total of 10 km. To estimate how many Squacco Herons were in the whole 35 km of channels, we then multiplied the average number per month by 35/10 = 3.5 birds/km^2. The results are given in the Delta Channels columns of Table 1.

To count birds in the part of Lake Albert within the Ramsar site, we made transects by boat in the open lake for a distance of 9.4 km. Here we could only record birds near enough to be seen (around 250 m, but varying with the conspicuousness of the species), but the numbers were low (it was not practical to use Distance software, as most birds were flying). It follows that our counts of birds in the lake will have been under-estimates. We also made counts along the lakeshore and the adjacent very shallow waters. This is a complex ecosystem, involving many plant species. Part of the shoreline is papyrus, but most is more open swamp, mainly vegetated by smaller macrophytes, including *Ottelia scabra, Ottelia ulvifolia, Nymphaea nouchali, Nymphaea lotus, Eichhornia crassipes* (water hyacinth), *Salvinia molesta* (Nile cabbage), *Ludwigia adscendens* (on sand bars within the lake) and many other species (S. Mutebi, pers. comm.). This habitat was similar in two open swamps along the north channel of the delta, and we combined the data from them with those of the 8.1 km lake shore habitat.

Results

During the course of the year, we recorded a combined total of 81 waterbird species at the delta. Site records for the park go back to the 1960s, since when just over 100 waterbird species have been recorded. Table 1 shows a sub-set of these data, containing all species of conservation concern (whether global, regional or national), plus the more numerous other species, for the two months in 2018 when counts were made for the whole Murchison Ramsar Site. The open waters of Lake Albert had the

fewest birds, but as indicated in the Methods section, the numbers recorded on the lake were only those seen from our transects, and their numbers, although still likely to have been relatively low compared to the other areas, will therefore have been under-recorded.

Table 1. Estimated total numbers of waterbirds in the whole Murchison Ramsar site in January and July 2018, showing species of conservation concern and all those with >10 individuals across all counts. There were 36 other waterbird species that were considered as vagrants when either recorded in other months, and/or with <10 individuals. Habitat: W: Waterbird G: Grassland species P: Palaearctic migrant A: Afrotropical migrant F: Forest species. Conservation status: EN: Endangered, VU: Vulnerable, NT: Near-Threatened; U: Uganda, G: Global. P (in numbers columns) = Present, but not counted. *Full datasheets for the 240 counts along the channels through the delta, and the 107 counts in Lake Albert, are available from MK at mkibiile@gmail.com.*

				January 2018					July 2018				
2016 No	Species	Habitat	Conservation status	R. Nile-Upstream	Delta channels	Open swamps	Open water	Total	R. Nile –Upstream	Delta channels	Open swamps	Open water	Total
2	White-faced Whistling Duck *Dendrocygna viduata*	W		24		175	18	217	29	12	10	2	53
3	Fulvous Whistling Duck *Dendrocygna bicolor*	W		2		12	7	21		4			4
6	Egyptian Goose *Alopochen aegyptiaca*	WG		101		3		104	43		3		46
7	Spur-winged Goose *Plectropterus gambensis*	W		28				28					
139	Black Crake *Zapornia flavirostra*	W		65	P	5		70	21	P	5		26
152	Grey Crowned Crane *Balearica regulorum*	WG	G-EN, U-EN	61	2			63	2	175	2		179
163	African Open-billed Stork *Anastomus lamelligerus*	AWG		4	2	73	1	80		70	10		80
168	Saddle-billed Stork *Ephippiorhynchus senegalensis*	W	U-VU	2				2			4		4
170	Pink-backed Pelican *Pelecanus rufescens*	W				6	1	7			10	8	18
172	Shoebill *Balaeniceps rex*	W	G-VU, U-EN			1		1			1		1
177	Black-crowned Night Heron *Nycticorax nycticorax*	PW		17				17	1				1
178	Striated Heron *Butorides striatus*	W	U-NT	9				9	3				3
179	Squacco Heron *Ardeola ralloides*	W		57	35	24	6	122	2		6	2	10
183	Grey Heron *Ardea cinerea*	W		18		8		26	3	2	1		6
185	Goliath Heron *Ardea goliath*	W	U-VU	16	3	3		22	8		1		9
186	Purple Heron *Ardea purpurea*	W		15	\6			21	4	26	1		31
187	Great White Egret *Ardea alba*	W		5		2		7					
188	Intermediate Egret *Ardea intermedia*	W		19	P	1		20	1				1
190	Little Egret *Egretta garzetta*	W		7	P	10		17					
191	Sacred Ibis *Threskiornis aethiopicus*	W		18	9	17		44					
196	Hadada Ibis *Bostrychia hagedash*	W		36	9			45	10	9			19
198	Long-tailed Cormorant *Microcarbo africanus*	W		453	115	240	17	825		12	44	32	88
199	Great Cormorant *Phalacrocorax carbo*	W		2	1	7		10			1		1
200	African Darter *Anhinga rufa*	W	U-VU	81	8	2		91	71	5	2		78

2016 No	Species	Habitat	Conservation status	January 2018					July 2018				
				R. Nile-Upstream	Delta channels	Open swamps	Open water	Total	R. Nile –Upstream	Delta channels	Open swamps	Open water	Total
208	Black-winged Stilt *Himantopus himantopus*	PW		2		6		8					
211	Common Ringed Plover *Charadrius hiaticula*	PW				15		15					
221	Long-toed Lapwing *Vanellus crassirostris*	W		50	P	19		69	7		1		8
222	Spur-winged Lapwing *Vanellus spinosus*	WG		64	4	8		76	36	4	7		47
227	African Wattled Lapwing *Vanellus senegallus*	W			32			32			2		2
231	African Jacana *Actophilornis africana*	W		92	P	200		292	62	P	88	4	154
244	Little Stint *Calidris minuta*	PW				11		11					
246	Great Snipe *Gallinago media*	PW	G-NT, U-VU			6	1	7					
250	Common Sandpiper *Actitis hypoleucos*	PW		19	6	6		31	7				7
264	Collared Pratincole *Glareola pratincola*	W				16	1	17					
266	Rock Pratincole *Glareola nuchalis*	W	U-VU	4				4	2				2
272	Grey-headed Gull *Chroicocephalus cirrocephalus*	W				108	1	109			4	2	6
280	White-winged Tern *Chlidonias leucopterus*	PW		2	53	90	40	185	1		11	10	22
336	African Fish Eagle *Haliaeetus vocifer*	W		27	2	1		30	19	2	2		23
358	Pel's Fishing-Owl *Scotopelia peli*	FW	U-EN						1				1
462	Malachite Kingfisher *Corythornis cristata*	W		46	P	4		50	14		3		17
464	Giant Kingfisher *Megaceryle maxima*	W	U-NT	3				3	2				2
465	Pied Kingfisher *Ceryle rudis*	W		279	124	4		407	269	113	11	1	394

The generally higher numbers of birds in January (3402 were counted, compared to 1452 in July (Table 2), are mainly due to the presence of Palaearctic migrants, of which the White-winged Tern *Chlidonias leucopterus* was the most numerous (Table 1). Overall, only the African Jacana *Actophilornis africana* and Pied Kingfisher *Ceryle rudis* had more than 100 birds in both January and July counts, whilst a further four species—White-faced Whistling Duck *Dendrocygna viduata*, Grey Crowned Crane *Balearica regulorum*, African Open-billed Stork *Anastomus lamelligerus* and Long-tailed Cormorant *Microcarbo africanus* had above 50 individuals in both months.

Table 2. Overall numbers of waterbirds from table S1.

	January 2018					July 2018				
	R. Nile (upstream)	Delta channels	Open swamps	Open water	Total	R. Nile (upstream)	Delta channels	Open swamps	Open water	Total
Number of species	42	31	42	13	62	30	18	31	9	44
Number of individuals	1695	491	1118	98	3402	632	414	244	62	1452

Seasonality

As would be expected, the number of species and particularly individuals, is higher in January than July (Table 2) and probably reflects movements of Ugandan resident species as well as large numbers of migrants, both Afrotropical and Palaearctic. The majority

of the large waterbird species recorded are present throughout the year in Uganda, but many of them do not nest within the Murchison Ramsar Site. Consequently, many birds leave for a part of the year, including Long-tailed Cormorant, African Open-billed Stork and White-faced Whistling Duck—some pairs of this intra-African migrant nest in the park (Carswell *et al.* 2005) (Fig. 2). Numbers of Long-tailed Cormorants in the months of August to November are presumably immatures, but this was not confirmed. The seasonality pattern for Purple Heron *Ardea purpurea* is less clear, but the higher numbers in December and February could be due to Palaearctic migrants.

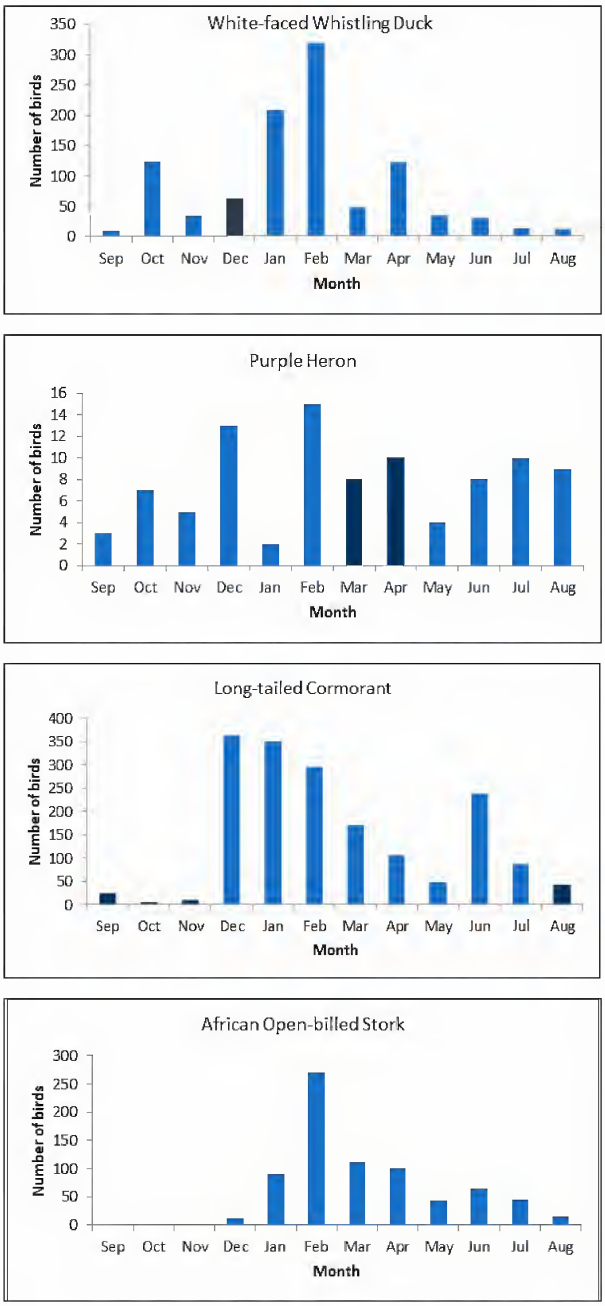

Figure 2. Seasonality of four waterbird species. All four species are resident in Uganda, but the nesting sites of those observed in the Ramsar site are not known, and some Purple Herons may be Palaearctic migrants.. The figure shows the combined total numbers of each species from monthly counts of the delta channels, open swamps and open waters of Lake Albert. The main egg-laying months of Purple Heron and Long-tailed Cormorant according to Brown & Britton (1980) are indicated in dark blue. For African Open-billed Stork, these months are September and October, when none were recorded.

Of the Palaearctic migrants, the numerous White-winged Black Terns, showed a strong southward passage in November and a comparable return in April (Fig. 3). Some Palaearctic species, such as Common Sandpiper *Actitis hypoleucos*, were present through the northern winter. The area also has large numbers of some non-waterbird passage migrants, notably Barn Swallow *Hirundo rustica* and Sand Martin *Riparia riparia* (Fig. 3), both of which are commonly seen over the various wetland habitats, where some also roost.

Up to seven Red-knobbed Coot *Fulica cristata* were recorded on Lake Albert in five months between November 2017 and July 2018 — a new distribution record. This species is widespread in Africa (Urban *et al.* 1986) so it is surprising that the only previous records in Uganda are from the south-west and south-east (Carswell *et al.*, 2005).

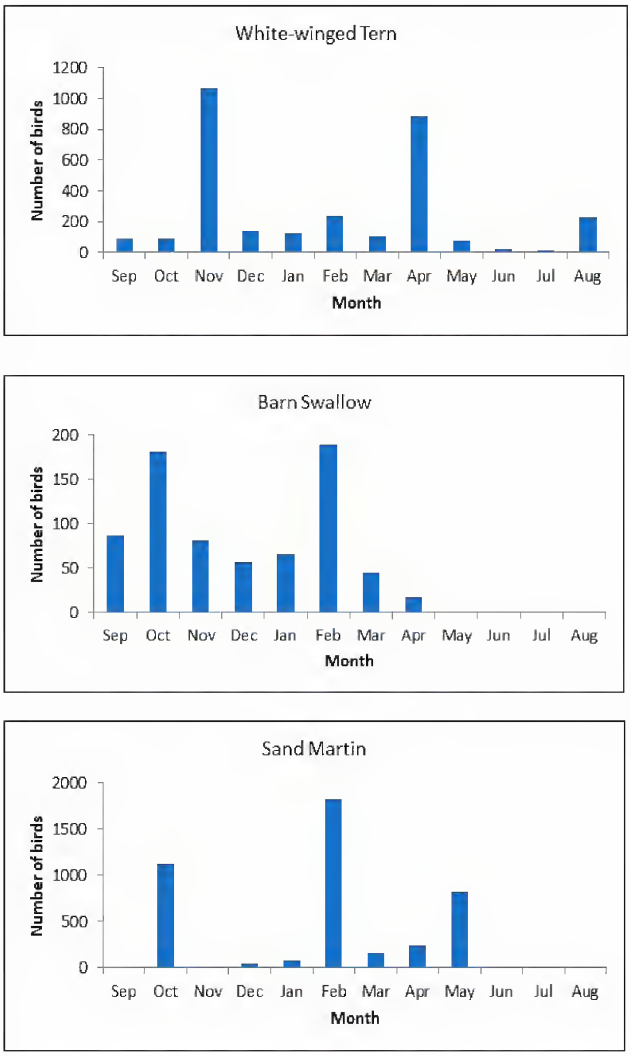

Figure 3. Numbers of three Palaearctic migrants in the same areas as for Fig. 2. The Ramsar site is important for many non-waterbird species, including Barn Swallows and Sand Martins.

Breeding

Within the Ramsar site, kingfishers nest in small cliffs at several sites along the river, and there is a small nesting colony of African Darters *Anhinga rufa* below the Murchison Falls. Sempala (1999), using aerial surveys, recorded several Shoebill nests in the delta, and presumably they still nest there. One Saddle-billed Stork *Ephippiorhynchus senegalensis* nest is in occasional use, and an estimated 15 pairs of African Fish Eagles nest in trees near the river. However, for the majority of herons, egrets, ibises and other large waterbirds, no nesting records are known from the Ramsar site, or elsewhere in the park and its surrounding areas.

Discussion

The Murchison Ramsar Site supports a good diversity of waterbirds, though many of them breed elsewhere, which largely explains the seasonal variations recorded. The count totals in Table 1 are minima, for several reasons. Firstly, as already noted, counts on Lake Albert were only transects of limited width. Secondly, it is known from aerial survey flights that there are a number of more open areas within the papyrus swamps, and these hidden areas will have supported some other waterbirds. Finally, we have given actual and average numbers, rather than just quoting the highest recorded for each species.

The Murchison Ramsar Site qualifies under Ramsar criteria 1, 2 and 3 (www.ramsar.org), although it does not have the very large numbers of waterbirds of some other sites, nor does it reach the 1% criterion for the global population of Shoebill *Balaeniceps rex*, estimated as 5000–8000 (Wetlands International 2019). Nevertheless, Murchison is a generally reliable site to find this enigmatic species that is much sought after by birders, who are usually successful in finding it here. And not only is there a large variety of waterbirds, the majority are easily seen, often at close range. Birding and nature-based tourism in general are of high importance to Murchison Falls and surrounding areas and bring significant economic benefits to the region. Roussouw & Sacchi (1998) describe a visit to Murchison as a must for every birder. As well as sustainable tourism, there are several other opportunities for wise use, as recommended by the Ramsar Convention, for which effective management is essential. This is particularly difficult to achieve for fishing, although sustainable harvesting of papyrus can be compatible with conservation of the important papyrus birds (Donaldson *et al.* 2010) and could be managed by the Uganda Wildlife Authority and the local communities around Wanseko town.

The Murchison Ramsar Site is more notable for the variety of species that it supports—78 of them—than their numbers. As we have stated, our counts represent conservative estimates; For example, during our counts on Lake Albert, we only saw birds for a distance of about 250 m on either side of our transects, representing only about 5 km^2 of the lake. As the lake has a total area of about 5300 km^2, it is likely as a whole to support tens of thousands of waterbirds, together with many thousands more along its shores, and the waterbirds that are there would very probably qualify the lake as another Ramsar site, to add to the present number of 12 in Uganda.

Several globally threatened species occur, notably the Shoebill and Grey Crowned Crane, for both of which Single Species Action Plans have been compiled (Dodman 2013, Morrison 2015), with the aim to also produce national action plans for both species for Uganda. Numbers of Grey Crowned Cranes recorded in July 2018 fall somewhat short of the 1% population threshold of 220 birds. There are also periodic

visits of African Skimmers *Rynchops flavirostris*, usually on sandbanks upstream from Paraa, with up to 200 between October and March (GK, pers. obs.), although they also move frequently, and were absent in the counts reported here. African Skimmers have been recorded in high congregations here, with a maximum of 1400 noted by Byaruhanga *et al.* (2001). In addition to the species recorded in Table 1, a pair of Pel's Fishing Owls *Scotopelia peli* appears to be resident just below the Falls, and a few Rock Pratincoles *Glareola nuchalis* are always found there too, with many more above the Falls (GK, pers. obs.), and past congregations noted of 500 – 1000 birds (Byaruhanga *et al.* 2001). The Near Threatened Papyrus Gonolek *Laniarius mufumbiri* is resident in the papyrus swamps, whilst species such as Greater Swamp Warbler *Acrocephalus rufescens* and Lesser Swamp Warbler *A. gracilirostris* breed here as well.

The wide range of habitats in the Murchison Ramsar Site is clearly a reason for the diversity of waterbirds. Those inhabiting the delta swamps are of course different from those of the open riverine and lake habitats, the former being the subject of a separate report (Kibuule *et al.*, in prep). Adjacent land habitats included in the Ramsar site as watershed protection areas also support many non-waterbird species, and they provide roosting sites for some species..

The outer edge of the delta swamps forming the lakeshore is particularly rich in birds, with Shoebill, Goliath Heron *Ardea goliath*, numerous African Jacanas, and many other waterbird species regularly recorded. The waters here are very shallow, and only suitable for small, shallow-draught boats, but the tourist potential is considerable. The local community could benefit by offering boat trips from Wanseko (Fig. 1) to the nearby parts of the lake, where a great variety of birds can be found. At the creation of the park, the western boundary was drawn as a straight line joining the two most westerly points of dry land, but that excluded the outer parts of the swamp, and the section of Lake Albert which is part of the Ramsar site. The Uganda Wildlife Authority is currently reviewing these boundaries, with a view to extending the park boundary to coincide with that of the Ramsar Site (P. Kasoma, pers. comm). The shallow lake waters are also heavily fished, and the site would benefit significantly from enforcing a sustainable fishing policy to ensure against over-fishing in the lake.

Several environmental factors could affect the future of waterbird numbers and diversity in the Ramsar site. Climate change is obviously one of them; for example, changes in rainfall affect water levels. Potential oil spills and related pollution from oil and gas operations also pose a direct risk to the lake, as well as to the wider environment. Over-fishing also affects fish-eating birds where it occurs. The extent and impact of fisheries has not been well studied at Murchison, but in the lake, fishermen told us that their fish catches have decreased considerably in recent years, and many of the fish are now smaller than they used to be. The breeding sites of several of the large waterbird species, such as Goliath and other herons, Pink-backed Pelicans *Pelecanus rufescens* and Long-tailed Cormorants, are unknown, but are likely to be in trees close to communal land. Consideration should be given to discovering where they nest, and encouraging the local communities to protect them.

Continuing twice-annual monitoring will help to track changes in bird populations that may result from these factors, and should then lead to potential management actions. Currently, the monitoring extends into the swamp, but ideally should be extended to the lake, for example, by a route that follows the southern channel of the swamp, proceeds northwards up the lakeshore and returns via the northern channel. By recording each section separately, comparisons with previous data for the long-established river sections can continue.

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Derek Pomeroy and Micheal Kibuule
Department of Zoology, Makerere University, Kampala, Uganda. Email: derekp@cantab.net

Tim Dodman
Hundland, Papa Westray, Orkney KW17 2BU, UK

George Kaphu
Uganda Wildlife Authority, Box 3530, Kampala, Uganda

Stephen Kigoolo
Biodiversity Solutions Ltd, P O Box 22587 Kampala, Uganda

Dianah Nalwanga and Micheal Opige
NatureUganda, Box 27034 Kampala, Uganda

David Ochanda
Total E&P Kampala, Uganda

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Notes on some Afrotropical migrants in East Africa with special reference to those recorded at the Ngulia Safari Lodge, Tsavo West National Park, Kenya

Donald A. Turner and Graeme C. Backhurst

Summary

Sixty-four species of Afrotropical birds that migrate within East Africa are treated, with emphasis on those found at Ngulia Safari Lodge, Tsavo West NP, southeastern Kenya during the long-running (1969–2019) ringing programme which concentrates on Palaearctic species. At Ngulia, the striking fact to emerge is the relative paucity of Afrotropical migrants, at least in the period October to April, compared to those from the Palaearctic.

Keywords Afrotropical migrant, East Africa, Ngulia, Tsavo West National Park

Chapin (1932), Moreau (1966), Elgood *et al.* (1973), and Dowsett (1988) have all discussed migrants within the Ethiopian (Afrotropical) Region, while Backhurst & Pearson (1977) gave details of a wide variety of Afrotropical species encountered at night or at dawn during ringing operations between late October and early February at Ngulia Safari Lodge in Tsavo West National Park, southeastern Kenya. The ringing programme at Ngulia (1969–2019), while primarily concentrating on Palaearctic migrants, has at the same time continued to record several known Afrotropical migrants, details of which are included here. Meanwhile in Tanzania, Moreau (1937) discussed long-distance African migrants occurring in Tanganyika, and later Beakbane & Boswall (1986) gave details of Afrotropical migrants appearing at lights in the Mufindi area of southern Tanzania during March, April and May 1982–1984.

Nomenclature and order of species follow the *Checklist of the Birds of Kenya*, 5th Edition (Bird Committee 2019).

Knob-billed Duck *Sarkidiornis melanotos*

Although widespread, most birds may simply be non-breeding migrants from the Southern Tropics, with movements linked to seasonal November to April rains. While often in small flocks, gatherings of up to 50 are quite frequent, although 700 or more at Ahero Rice Scheme in February 1983 was exceptional. Meanwhile, several thousand are regularly reported during May to September on the Usangu floodplains in southern Tanzania, and several birds ringed in Zimbabwe have reached Shinyanga in northern Tanzania, and also to the DR Congo and the Sudan.

Southern Pochard *Netta erythrophthalma*

Netta erythrophthalma brunnea (Eyton 1838). Type locality South Africa.

Formerly fairly common and widespread, but with populations declining everywhere; in recent years it has largely become an uncommon non-breeding intra-African migrant (June through to October) to highland lakes in Kenya and Tanzania, while counts of over 2000 at Nakuru in October 1983, at Naivasha in January 2003 and July 2012, were unprecedented. One ringed at Benoni, South Africa in December 1953 was recovered at Lake Naivasha the following November. In Uganda, the very few 1985–2006 records contrast sharply with historical reports of large numbers on lakes in Kigezi and Ankole districts during the 1930s. No recent records.

Red-billed Teal ***Anas erythrorhyncha***

Locally common on many inland wetlands but it is generally scarce in coastal areas. In Tanzania, two South African-ringed birds have been recovered near Mbeya, southern Tanzania, and the 20000 or so on Lake Singida in December 1993 may have involved some southern African breeding birds. In Uganda, an uncommon intra-African migrant and wanderer to Lake Munyanyange, Queen Elizabeth NP and nearby southwestern wetlands; however, the few recent records suggest a decline in recent years.

Harlequin Quail ***Coturnix delegorguei***

A 'rains' migrant in all areas and subject to large scale, erratic movements. A common 'night migrant' at Ngulia during November and December, where 2169 have been ringed to date, almost all caught at night, with one reported recovery to Soroti in eastern Uganda. Breeds opportunistically when suitable conditions occur, and generally following locally good rains.

Southern Yellowbill ***Ceuthmochares australis***

Wide ranging throughout most Tanzania coastal forests (including Mafia, Zanzibar, and Pemba) north to the Pugu Hills and Dar es Salaam, also through the Eastern Arc mountains north to the Ngurus, East Usambaras, Arusha National Park and forests south of Moshi. In Kenya, while formerly resident in the Kitovu Forest near Taveta, elsewhere it is largely an intra-African migrant from the Southern Tropics from May to November, occurring north to Kibwezi and the Tsavo region (including Ngulia where to date five have been caught and ringed at night), and in coastal woodlands from the Shimba Hills north to the Arabuko-Sokoke-Dakatcha woodlands, the Lower Tana and the Boni-Dodori National Reserves. Elsewhere, vagrants have been recorded north to the central highlands in the Kikuyu Escarpment forests and some Nairobi suburbs, and on occasions further north to Samburu and the Mathews Range.

Jacobin Cuckoo ***Clamator jacobinus***

Clamator jacobinus pica (Hemprich & Ehrenberg 1833). Type locality Sudan.

A widespread migrant from the Northern Tropics during November and December, returning north late February to May, with over 500 ringed at Ngulia to date. Elsewhere, there have been a few sporadic and largely opportunistic 'breeding' records between February and July.

Clamator jacobinus serratus (Sparrman 1786). Type locality South Africa.

A widespread migrant from southern Africa, April to October, north to around the Equator.

[The nominate form is reportedly an annual migrant from India to southeastern Africa November to April (Clancey 1980, Irwin 1981), but movements through eastern Kenya and Tanzania remain unclear because of the presence of *C. j. pica* in many areas. However, birds with wing measurements fitting those of the nominate race have been ringed at Ngulia during the southward passage period.]

Levaillant's Cuckoo *Clamator levaillantii*

A widespread and highly seasonal 'rains' migrant in virtually all regions, which may involve a single population undertaking a year-round movement coinciding with movements of the inter-tropical convergence zone (ITCZ) and all regional rainy seasons: southeastern and southern Tanzania (November to April); western and northwest Tanzania (October to June); southwestern and western Uganda (December to May), the Lake Victoria basin, western Kenya, Elgeyu, Laikipia and the central Rift Valley (April to September). Meanwhile, the origin of birds occasionally recorded at Ngulia and elsewhere in southeastern Kenya during the November to December 'short rains' remains unclear but may refer to birds moving south with the southward moving (ITCZ) rain belt.

Great Spotted Cuckoo *Clamator glandarius*

Clamator glandarius glandarius (Linn. 1758) Type locality Gibraltar.

Migrant from the Northern Tropics October to April when present in varying numbers in Uganda, Kenya and northern Tanzania. Movements and opportunistic breeding coincide with periods of heavy rain (November and December in southeastern Kenya and northern Tanzania, and January and February in the Serengeti region of Tanzania). It is unclear if Palaearctic birds reach East Africa.

Clamator glandarius choragium Clancey 1951. Type locality Natal, South Africa.

Records during the period May to September largely belong here, as may some July records in Uganda and southern Tanzania together with those of birds observed moving south in September. Meanwhile, there are several (racially unassigned) June and July historical specimens from Teso District (Uganda) and Kavirondo (Lake Victoria basin), and two June to August breeding records from the central Rift Valley in Kenya that may be attributable to this southern form.

Diederik Cuckoo *Chrysococcyx caprius*

While most equatorial populations are largely sedentary, many southern and northern breeding birds appear to move in tandem twice a year, resulting in some southern African birds spending their non-breeding period (April to September) alongside northern breeding populations, and some birds from the Northern Tropics doing likewise (November to February) alongside some southern breeding birds (Clancey 1990). Long-winged birds from the Southern Tropics are known to winter as far north as DR Congo and the Sudan, which presupposes that some non-breeding birds in eastern Africa may originate from both north or south of our region. Large numbers (possibly including some birds from the Northern Tropics) are present in the Tsavo region of southeast Kenya (342 ringed at Ngulia to date) November to January, while influxes to the Baringo area during the July to August rains may include some southern breeding birds. Present year-round in Uganda, but with a marked increase in calling birds February to mid-May, which may include some long -distance migrants.

Red-chested Cuckoo *Cuculus solitarius*

Although largely absent from the coastal lowlands, it is an intra-African migrant between November and March to much of Tanzania north to the Ngara and Kagera regions, also in southwest Uganda and the Serengeti–Mara region. Meanwhile, it is very much a 'rains migrant' (November to February) to the Rukwa Valley, Katavi, Ruaha, Mikumi, Tarangire, Manyara and Mkomazi National Parks and the greater Tsavo region (including Ngulia), and while birds occurring in southern and south-eastern coastal Tanzania (October to April), including the Selous Game Reserve refer to migrants from the Southern Tropics, this may also account for records during this period from Dar es Salaam north to some Kenya coastal areas.

Black Cuckoo *Cuculus clamosus*

Two populations: one a widespread intra-African migrant from southern Africa (October to April) occurring largely east of 35°E in acacia woodlands, bush and cultivation; the second (including birds referred to as *C. c. jacksoni*), is an itinerant 'rains migrant' over much of Uganda, western and southwestern Kenya east to acacia woodlands in Laikipia and the central Rift Valley, with sporadic records south to Mtito Andei and Naberera (November, December) and Muheza (April). Five have been ringed at Ngulia, including birds caught at night in November and December.

African Cuckoo *Cuculus gularis*

A widespread yet uncommon intra-African migrant, but with few dated breeding records. While movements remain largely unclear, it is very much a 'rains migrant' to most areas, generally coinciding with movements of the inter-tropical convergence zone (ITCZ) and all regional rainy seasons. Vocal birds, generally arriving in areas during or following periods of heavy rain, recorded from the Kerio and Rift valleys (March to June), Baringo (August and September), the Tsavo region including Ngulia (November and December), *miombo* woodlands in interior Tanzania (October to December), and the Maswa-Serengeti region (December to March).

Nubian Nightjar *Caprimulgus nubicus*

Wide ranging in dry bush country north and east of the Kenya highlands, but with so few birds handled and critically examined, its status as a breeding resident or a largely non-breeding intra-African migrant (November to March) remains unclear. Dated records range from January and early February at Lake Turkana, July and early August at Lodwar and Lokichoggio, November and December at Ngulia (35 birds ringed to date), and in the southeast Taru steppe country. Bearing in mind the numbers passing through Ngulia during the November–December rains, plus the fact that the type of *taruensis* was collected so close to the Tanzania border, it is generally assumed that the range of *taruensis*-type birds at least, extends further south, although there are no confirmed records from northern Tanzania as yet.

Plain Nightjar *Caprimulgus inornatus*

A little known intra-African migrant October to April, and birds breeding in SW Saudi Arabia and Yemen also winter in Africa (Vaurie 1965). Regular southward passage occurs through the Rift Valley and eastern Kenya October to December, south at least to the Lake Manyara and Mkomazi NPs, and the eastern Tanzania lowlands; 492 birds have been ringed at Ngulia to date. Elsewhere, an extremely fat bird at Olorgesaillie in April, and several collected in the Tana Delta area in mid-March 1973 were

most probably long-distance migrants returning north. Elsewhere there are February to March specimens from Tanga and Dar es Salaam.

Standard-winged Nightjar ***Macrodipteryx longipennis***
A locally common dry season (December to March) intra-African migrant across northern Uganda and northwestern Kenya, south to Murchison Falls National Park, Gulu, Soroti, Karamoja, and West Pokot districts, with vagrants reported south to Lake Baringo in January 1979, 1984, and November 1990.

Pennant-winged Nightjar ***Macrodipteryx vexillarius***
A trans-Equatorial and intra-African migrant moving to and from breeding grounds in the miombo woodlands of the Southern Tropics. Heavy southward passage takes place through Uganda, the Lake Victoria basin and western Tanzania during July and August to breeding grounds in miombo woodlands in Tanzania south of 6°S. Elsewhere, smaller numbers are recorded annually in western and southwestern Kenya, with occasional vagrants reported from Laikipia and the central highlands. The return journey to the Northern Tropics takes place during February and March.

Forbes-Watson's Swift ***Apus berliozi***
A little-known species which is an intra-African migrant occurring in coastal lowlands November to February, south at least to the Lower Tana, Malindi and Kilifi districts, with occasional (unsubstantiated) reports from Shimba Hills and elsewhere south of Mombasa. A large flock reported near Dar es Salaam in March 1996 remains the only confirmed record from Tanzania.

African Crake ***Crex egregia***
Largely an intra-African 'rains' migrant from the Southern Tropics typically occurring between November and April in southern and southwestern Tanzania, and April to October elsewhere. Some populations, notably in Tanzania, may simply follow the rains north and south, while others will remain after breeding if suitable conditions allow. In Kenya, it is largely reported from inundated grasslands in the Mara Game Reserve and Lake Victoria basin, also in Thika District, at Lake Baringo and in coastal lowlands north to the Tana Delta and Lamu District. Nocturnal movements reported from Nairobi, Ngulia (two caught and ringed at night, November 1979) and at Mufindi in the Iringa Highlands, southern Tanzania.

Striped Crake ***Amaurornis marginalis***
A scarce and local intra-African migrant from the Southern Tropics May to November, north in coastal lowlands to Zanzibar, Mombasa and Tana River District, inland to the Mara Game Reserve, Nairobi, Thika, Naivasha, Baringo and Mt Kenya, with night migrants recorded in May at Nairobi and at Mufindi, near Iringa.

Allen's Gallinule ***Porphyrio alleni***
A local and uncommon resident and migrant, with resident populations augmented by intra-African migrants from the Southern Tropics May to September, resulting in seasonal concentrations occurring from the Rukwa, Usangu and Kilombero wetlands north to Tarangire National Park, lakes Kalemawe, Jipe, Naivasha and Baringo, and in coastal lowlands north to Mombasa and the Tana Delta. Breeding reported from southwestern Tanzania during December and January, on Pemba and Zanzibar in

July and August, the Tana Delta in January, and at Lake Baringo in June and July. In Uganda it is a widespread intra-African migrant with numbers reported from May to July at Kibimba Rice Scheme, Queen Elizabeth National Park, Teso and Lango districts and in Kidepo Valley National Park.

Lesser Moorhen ***Gallinula angulata***

An intra-African migrant and opportunistic breeder from the Southern Tropics, mainly April to August, when during seasons of high rainfall it is locally common in wetland areas north to the Kagera Valley swamps, the Lake Victoria basin, Rift Valley lakes, Nairobi and Thika districts; also in coastal lowlands including the Lower Tana where it becomes locally abundant and it breeds during periods of extensive flooding. Elsewhere, nocturnal movements have been noted during the November-December rains with birds attracted to lights at the Ngulia where five have been caught and ringed at night; also, during April and May at Mufindi, near Iringa. See also Benson & Irwin (1965).

Streaky-breasted Flufftail ***Sarothrura boehmi***

A scarce migrant from the Southern Tropics, May to August, with many attracted to lights in the Mufindi Highlands, southern Tanzania during its northward passage. Elsewhere, several were reported calling in flooded grassland in Nairobi National Park during May 1988, also in the Grumeti area of Serengeti National Park in early May 2018. Occasional opportunistic breeding suspected in some areas of central Kenya, while elsewhere there are historical records from Trans-Nzoia, Kisumu, and Machakos.

Greater Painted-snipe ***Rostratula benghalensis***

Widespread in permanent swamps from sea level to 2000 m with considerable yet poorly understood local movements. Seasonal in many areas with influxes coinciding with periods of high rainfall, and five ringed at Ngulia in December 1996 suggest that some may be intra-African migrants.

Common Buttonquail ***Turnix sylvaticus***

Locally common in short grassland areas particularly during the rains, from northern border areas south to the Turkwell and central rift valleys, Samburu, Laikipia and Isiolo districts, the Northern Uaso Nyiro, Meru and Kora National Parks, Galana Ranch, the Tsavo, Mkomazi and Tarangire National Parks, while a regular nocturnal migrant at Ngulia during the November-December rains with 79 ringed there to date. Generally uncommon in coastal lowlands from Lamu District south to the Tana and Sabaki estuaries, and while formerly reported common on Zanzibar, its current status there and on Pemba Island requires clarification. Elsewhere it is largely a rains migrant from the Mara-Serengeti grasslands south to the Wembere floodplains, Tabora Region, the Rukwa Valley, Ruaha National Park, Selous Game Reserve, Njombe and Songea districts.

Bronze-winged Courser ***Rhinoptilos chalcopterus***

An uncommon yet widespread intra-African migrant from the Southern Tropics from May to November when it occurs across much of southern Tanzania, north to the Tabora Region, Serengeti, Manyara, Tarangire and Arusha National Parks, southern and southeastern Kenya including at Ngulia and the coastal lowlands, with

wanderers recorded north to the Mara Game Reserve, also Nairobi and Meru National Parks and the Lower Tana. In Uganda scattered June to November records from Queen Elizabeth and Lake Mburo National Parks north to Mbarara, Kampala and Teso districts would appear to refer to intra-African migrants.

Collared Pratincole *Glareola pratincola*

Glareola pratincola fuelleborni Neumann 1910. Type locality Lake Rukwa, southwestern Tanzania.

Widespread in low rainfall areas, being locally common seasonally at several Rift Valley lakes from Turkana south to Baringo, also from Magadi, Natron and Manyara south to the Wembere, Katavi and Ruaha National Parks, the Usangu wetlands and Lake Rukwa. Elsewhere, subject to erratic influxes to Amboseli and Tsavo National Parks, and Lake Jipe; an immature bird was caught and ringed at dawn at Ngulia on 16 November 1993. In Uganda, it is locally common from April to September around lakes Edward and George (Queen Elizabeth National Park), and large numbers along the Albert Nile (Murchison Falls National Park) in early October 1970 and January 2018 may have originated from outside Uganda.

African Open-billed Stork *Anastomus lemelligerus*

A widespread and locally common resident and intra African migrant. Subject to extensive local movements as indicated by the often large, non-breeding flocks that occur periodically in Uganda (October–March), at Lake Turkana (November–December), and other Rift Valley lakes as well as in southeastern Kenya and northeastern Tanzania. Large numbers (often up to 10000 to 12000 birds) can be present with other storks, ibises, herons and egrets in the Tana Delta; breeding recorded at the Garsen and Wembere heronries whenever suitable conditions exist. Elsewhere, it is locally abundant in the Kagera Valley swamps, and large flocks are regularly reported between November and March in the Kilombero and Ruaha-Usangu wetlands of southern Tanzania.

Abdim's Stork *Ciconia abdimii*

A trans-Equatorial and intra-African migrant from the Northern Tropics late October to April, whose movements are timed to coincide with the rains and subsequent emergent insect infestations. As a passage migrant October to December and February to April, the bulk of the movement is centred around the Lake Victoria basin with the vast majority of birds wintering south of our region. Meanwhile, sporadic opportunistic breeding records have been recorded in Uganda and western Kenya.

Great White Pelican *Pelecanus onocrotalus*

Locally abundant on many Rift Valley lakes, and athough movements between lakes in Ethiopia, Kenya and Tanzania are not clearly defined, it does breed erratically on undisturbed alkaline lakes south to Lake Rukwa, and two ringed in 1973–1974 at Lake Shalla in Ethiopia were later recovered at Lake Nakuru and Gilgil, and one Israeli-ringed bird reached Lake Naivasha on 20 July 2013. In Uganda, it is always present around lakes Edward, George and Albert, but is subject to erratic movements with peak numbers in May and fewest in December and January. Meanwhile, birds recorded in the Nile Valley and northwestern Uganda may be wanderers from the Sudd wintering grounds of Palaearctic birds.

Little Bittern ***Ixobrychus minutus***

Ixobrychus minutus payesii (Hartlaub 1858). Type locality Senegal.

Widespread resident augmented by intra-African migrants from the Southern Tropics May to September. Owing to its skulking habits, it is almost certainly commoner than the current data suggest. Single birds ringed at Ngulia in 1978, 1979, and 1989, were all caught at night.

Dwarf Bittern ***Ixobrychus sturmii***

Widespread 'rains migrant' augmented by intra-African migrants during April–August and November–December, with periodic concentrations reported in the Selous Game Reserve and the Tana Delta. Frequently attracted to the lights at Ngulia with four ringed there to date. See also Benson & Irwin (1966).

Cattle Egret ***Bubulcus ibis***

Common and widespread throughout much of our region, with every indication that all populations are increasing. Large numbers breed with other herons, egrets, storks and ibises in the Lower Tana and Wembere heronries, and around 10000 pairs were estimated breeding on the Wembere flood plains in April 1962. Elsewhere, it frequently breeds and roosts in or close to major cities, towns and highways (5000 roosting near Kampala in 2000 increased to over 15000 by mid-2016), and the total East African population is estimated to be well in excess of a million birds. Meanwhile, although only two birds have been ringed at night at Ngulia, four South African ringed birds have been recovered in Tanzania and three in Uganda, and a juvenile bird ringed near the Caspian Sea in July 1980 was recovered in October of that year in Ethiopia.

Wahlberg's Eagle ***Hieraaetus wahlbergi***

Predominantly an intra-tropical migrant with most birds occurring between August and April, though some in the Lake Victoria basin and southern Tanzania may be present all year round. Birds from the Northern Tropics move south during July and August to breeding grounds south of the Equator, returning north during March and April. All migratory movements appear based on rainfall patterns with birds present during the rains in both northern and southern parts of their ranges when they can best exploit seasonally abundant food supplies. Several major flyways are used during migration time, most notably along the Albertine Rift from Lake Albert south to lakes Edward, Kivu, and Tanganyika, and along the Kagera River Valley. See also Meyburg *et al.* (1995).

Black Kite ***Milvus migrans***

Milvus migrans parasitus (Daudin 1800). Type locality the Cape, South Africa.

'Yellow-billed Kite' In many areas it is the commonest, boldest, most ubiquitous, and the most adaptable large raptor in Africa, being a widespread resident as well as a common intra-African migrant, with birds from both the Northern and Southern Tropics reaching our area. Influxes of non-breeding birds from the south occur during May and June north possibly to around the Equator, while birds from the Northern Tropics move south into Uganda and northern Kenya at the same time (September and October) that nominate birds are also arriving, and when southern breeding *parasitus* are themselves returning south (late July to September), with a

marked passage along Lake Tanganyika during August and early September.

Grasshopper Buzzard ***Butastur rufipennis***

A wide-ranging migrant from the Northern Tropics, November to April across much of northern and central Uganda, while somewhat erratically from northern, eastern and southeastern Kenya south to central, north-eastern and eastern Tanzania. Elsewhere, August records from Kidepo Valley National Park (1966), Nakuru (1979) and Lockichoggio (2001) were exceptional and possibly suggestive of an early southward movement. Will often congregate at grass fires to feed on grasshoppers and other large insects. Meanwhile numbers in East Africa appear to be declining in recent years because of, in part, to habitat loss in the Sahel regions, also possibly to a lack of large insect infestations as a result of intensive aerial spraying.

White-throated Bee-eater ***Merops albicollis***

Common intra-African migrant from the Northern Tropics September to April with large numbers 'wintering' in coastal lowlands from southern Somalia south to the Tana and Rufiji Deltas and inland to the Selous Game Reserve and Ruaha National Park. In Uganda, it is a widespread post-breeding migrant south to lakes Victoria, George, and Edward. Small numbers breed annually at Lake Turkana, also in the semi-arid areas of the southern Rift Valley at Olorgesailie (near Magadi), and the Lake Natron basin.

Northern Carmine Bee-eater ***Merops nubicus***

Primarily a post-breeding intra-African migrant September to March from the Northern Tropics when it is common along the Nile Valley, northwestern Uganda, and locally abundant in coastal mangroves from the Somali border south to the Tana and Rufiji deltas, and Lindi District, with occasional wanderers inland to the Selous Game Reserve, Ruaha National Park and the Tsavo region. Elsewhere, small numbers breed erratically in Turkana District, northwestern Kenya March to June.

Southern Carmine Bee-eater ***Merops nubicoides***

Migrant from Southern Tropics May-August, ranging north through western Tanzania to Ngara and Biharamulo districts, also to Katavi, Mahale and Ruaha National Parks, while in Uganda there are records from Lake Mburo National Park in July 1998, Murchison Falls National Park July 2003, 2005, 2007 and 2015. In Kenya it is known only from Lake Kanyaboli in June 1972 and the Kedong Valley in July 1977.

Rufous-crowned Roller ***Coracias naevius***

Coracias naevius naevius Daudin 1800. Type locality Senegal.

Uncommon intra-African migrant occurring in interior Kenya and northern Tanzania, with smaller numbers recorded south to Tabora, Dodoma and Iringa districts, Ruaha and Mikumi National Parks and the northern Selous, but with numbers fluctuating considerably from year to year. While birds appear to be present in the central Kenya Rift Valley between April and October, and occur annually in Tsavo East National Park from March to July, the very few breeding records suggest that most birds may be post-breeding migrants. Meanwhile in Uganda (with no breeding records), all records from northern and northeastern areas are mainly between November and March.

Lilac-breasted Roller *Coracias caudatus*

Coracias caudatus lorti Shelley 1885. Type locality Somaliland.

Largely a non-breeding intra-African migrant between December and March to northeastern and eastern Kenya from Mandera, Wajir, and Garissa districts south to the Lower Tana and on occasions to Galana Ranch and the Tsavo region (including Ngulia where two birds of this race have been ringed). There is some seasonal overlap with nominate birds along the Lower Tana from Garsen to Garissa.

Broad-billed Roller *Eurystomus glaucurus*

Eurystomus glaucurus suahelicus Neumann 1905. Type locality Lower Tana River, Kenya.

Many birds along the Galana and Athi rivers, and from the Lower Tana north to Meru National Park and the northern Uaso Nyiro are largely a widespread intra-African 'rains' migrant (October to April) south to Tsavo, Taita-Taveta, Moshi and Arusha districts and through interior Tanzania, with some post-breeding concentrations often evident in southern Tanzania during February and March. Elsewhere many coastal populations in the Boni-Dodori NRs, the Arabuko-Sokoke Forest, Shimba Hills, Dar es Salaam, Lindi, and Mikindani districts appear to be resident year-round.

African Pygmy Kingfisher *Ispidina picta*

Ispidina picta picta (Boddaert 1783). Type locality Senegal.

Widespread in bushed and wooded habitats throughout much of Uganda east to western and southwestern Kenya, Elgon, Lake Turkana, the South Kerio, and Baringo districts, and south to Tanzania border areas in the Kagera Region and the Grumeti riverine area of the western Serengeti National Park. Elsewhere, records from Thika District, Meru, Nairobi, Tsavo East and Arusha National Parks, Ngulia, and Pemba Island undoubtedly refer to migrants, but just how many November to February records of nominate *picta* actually refer to migratory birds from the Northern Tropics is unclear.

Ispidina picta natalensis (A.Smith 1832). Type locality Natal, South Africa.

Resident and non-breeding migrant from the Southern Tropics April to September, ranging north to northwest Tanzania, southern and western Uganda, central and southeast Kenya, and in coastal lowlands (including Mafia, Zanzibar and Pemba) north to the Shimba Hills, Arabuko-Sokoke and Lower Tana River forests. See also Benson (1964).

Grey-headed Kingfisher *Halcyon leucocephala*

Halcyon leucocephala leucocephala (Muller 1776). Type locality Senegal.

Widespread resident and wanderer, also a migrant from the Northern Tropics November to March, south at least to the Lake Victoria Basin, Ngara and Tabora districts, Lake Manyara, Amboseli, Tsavo, Mkomazi and Tarangire National Parks. To date, 99 presumed migrants have been ringed at Ngulia during November and December, and two Ethiopian-ringed birds have been recovered at Kisumu and near Mombasa

Halcyon leucocephala semicaerulea (Gmelin 1788). Type locality Yemen.

Migrant from the Northern Tropics November to March south at least to Nairobi and the Lower Tana River.

Halcyon leucocephala pallidiventris Cabanis 1880. Type locality Angola.

Inter-tropical migrant from the Southern Tropics April to September, ranging north through Tanzania to western and southern Uganda, also to Nyanza and Nandi districts of western Kenya. Some individuals may breed along the Ruvuma River and in Songea District, October to December. Elsewhere, a Malawi bird ringed on 8 December 1981 was killed to the northwest in the DR Congo on 26 May 1982 (Dowsett-Lemaire & Dowsett 2006).

Woodland Kingfisher *Halcyon senegalensis*

Halcyon senegalensis cyanoleuca (Vieillot 1818). Type locality Angola.

Largely a non-breeding migrant from the Southern Tropics, May to August, north to the Lake Victoria basin, the Mara Game Reserve and at some Rift Valley lakes from Manyara north to Naivasha and Baringo.

Mangrove Kingfisher *Halcyon senegaloides*

Largely an intra-African migrant April to mid-November to coastal estuaries and mangroves north to Mombasa, Kilifi and Lamu districts, and the Boni-Dodori National Reserves, and inland along the Lower Tana to Garsen. One ringed at Ngulia on 1 December 2003 was exceptional, and the first record for Tsavo West National Park.

African Pitta *Pitta angolensis*

Wide ranging intra-African migrant from the Southern Tropics April to October when it is often attracted to the lights of cities and rural buildings, as highlighted by the numbers caught and ringed at a Mufindi tea factory in the Iringa Highlands between March and May 1982–1984. Formerly reported annually in Kenya coastal forests north to Gede and Arabuko-Sokoke Forest Reserves, but few recent records. Meanwhile, small numbers breed December to April in dense deciduous thickets in southern and southeastern Tanzania and in the Kiwengoma Forest Reserve on the Matumbi Massif south of the Rufiji River. In Uganda, there are fewer than 25 vagrancy records, with very few in recent years. See also Benson & Irwin (1964).

Black Cuckooshrike *Campephaga flava*

A widespread intra-African migrant from the Southern Tropics April to November, including throughout the coastal lowlands; 29 have been ringed at Ngulia, almost all having been caught at night. Elsewhere, small numbers may possibly be resident and breeding in some *miombo* woodlands in Tanzania. September to March, while sporadic breeding records have also been recorded in some highland areas of Kenya and northern Tanzania. See also Britton (1973).

Red-shouldered Cuckooshrike *Campephaga phoenicea*

Primarily an intra-African migrant from the Northern Tropics November to April, though small numbers may be resident and breeding in southern Uganda between March and June. In Kenya, records from Ukwala, Kisumu, Busia, Mumias, Kakamega, and Nandi districts are mainly from January to April, though its movements and its current status throughout remains largely unclear.

African Golden Oriole *Oriolus auratus*

An intra-African migrant from both the Northern and Southern Tropics.

Oriolus auratus auratus Vieillot 1817. Type locality Africa = Ghana.

Uncommon migrant from the Northern Tropics to northern Uganda June to February, with records south to Toro, Lango and Teso districts, and in northwestern Kenya at Elgon. Elsewhere, late May and October records from the South Kerio Valley and Baringo District may belong here.

Oriolus auratus notatus Peters 1868. Type locality Tete, Mozambique.

A common migrant from the Southern Tropics April to October; many breed in southern Tanzania *miombo* woodlands. It occurs throughout the year at Dar es Salaam, and in Kenya it is a common migrant throughout the coastal lowlands, north to the Arabuko-Sokoke Forest, the Lower Tana, and Lamu District. Elsewhere it is scarce inland, north to Ankole District, the Lake Victoria basin, South Nyanza, the Serengeti-Mara woodlands, Arusha National Park and some central Kenya areas including Nairobi National Park.

White-crested Helmet-shrike *Prionops plumatus*

Prionops plumatus poliocephalus (Stanley 1814). Type locality northern Mozambique.

Largely a wide-ranging, post-breeding migrant from the Southern Tropics May to September, north to around the Equator, though some populations may be breeding residents in some lowland areas of interior southern Tanzania, including the Rukwa Valley, Ruaha NP and the Selous GR.

African Paradise-flycatcher *Terpsiphone viridis*

Terpsiphone viridis plumbeiceps Reichenow 1898. Type locality Angola.

Largely an intra-African migrant from the Southern Tropics October to February, north to Kigoma, the Rukwa Valley and Kilosa District, also in coastal lowlands north to Mafia, Zanzibar and Pemba islands, Mombasa, Malindi and Tana River districts. [Although 109 individuals have been ringed, mostly caught at night, at Ngulia to date, none has been racially assigned.]

Pygmy Sunbird *Hedydipna platyura*

A seasonally common intra-African migrant (November to March) from the Northern Tropics to northern Uganda and West Nile District. Elsewhere, scattered records from Kidepo National Park south to South Karamoja, with periodic influxes to northwestern Kenya, South Turkana, the Kerio Valley, and Baringo District.

Chestnut Weaver *Ploceus rubiginosus*

A widespread 'rains migrant' in eastern and northeast Uganda (largely in Karamoja District), northern and eastern Kenya south through Laikipia, Samburu and Shaba National Reserves, Meru National Park and the eastern plateau country to Machakos and Kitui districts and the greater Tsavo region, also in the southern Rift Valley from Olorgesaillie to Magadi and Lake Natron, and from Monduli District east to the Arusha lowlands, Tarangire and Mkomazi National Parks, and south through Masailand and the dry interior to Singida and Dodoma districts and Ruaha National Park. With the exception of the Laikipia Plateau, it is largely absent from all highland areas above 1700 m, the Lake Victoria basin and the coastal lowlands. At Ngulia, numbers vary greatly from year to year and 1147 have been ringed to date with one recovered 210 km northwest in 1975.

Golden Pipit *Tmetothylacus tenellus*

With widespread seasonal influxes during the November and December rains, coupled with extensive northerly and southerly movements in both southeastern Ethiopia and Somalia, the large numbers encountered at Ngulia during the night and immediately after dawn suggest that many of the 107 birds ringed there to date may have originated from Somalia and/or Ethiopia where it is largely absent during this period (Ash & Miskell 1998, Ash & Atkins (2009)

Singing Bush Lark *Mirafra cantillans*

Mirafra cantillans marginata Hawker 1898. Type locality eastern Ethiopia.

Subject to extensive movements during or following periods of high rainfall, with northern birds appearing to move south with the November–December rains, through Turkana and Marsabit districts to Shaba Game Reserve and the eastern plateau country, also to southern Kenya/northern Tanzania border areas from Namanga, Longido and Monduli District east to the Mt Meru and Kilimanjaro lowlands and the Tsavo-Mkomazi grasslands. Twenty have been ringed at night at Ngulia to date. Elsewhere, large numbers, including juveniles, were present on the Aruba plains, Tsavo East National Park during August 1988 and August 1990, and several were reported in the central Rift Valley (Baringo and the Kedong Valley) in June and July 1988, and around Lockichoggio in July 2001 and April 2003. In Uganda, it is known only from South Sudan border areas, Soroti District April 1913 and November 1917, Kidepo Valley National Park July and August 1966, 2006, 2017 and 2019, and at Arua, West Nile District in July 1969.

Friedmann's Lark *Mirafra pulpa*

A scarce and little-known intra-African migrant/nomad, subject to almost annual influxes to the Tsavo and Mkomazi grasslands, generally appearing with the November–December rains when often highly vocal. Four birds have been ringed at Ngulia to date. Breeding has been suspected but never confirmed. Elsewhere, also recorded from Kiboko in early April 1965, and in Shaba Game Reserve in November 2008, May 2010 and April 2014.

African Reed Warbler *Acrocephalus baeticatus*

Acrocephalus baeticatus cinnamomeus Nocturnal movements through Ngulia in southeast Kenya during November and December, and two birds caught at Mt Marsabit in early March 2000, thought at the time to be on passage, are all suggestive of some long-distance movements. The nominate race is a known migrant in southern Africa (Kennerley & Pearson 2010).

Grey-rumped Swallow *Pseudhirundo griseopyga*

Pseudhirundo griseopyga griseopyga (Sundevall 1850). Type locality Gabon. Numbers fluctuate considerably, probably due to the presence of intra-African migrants from both the Northern and Southern Tropics.

i). A population possibly originating from the Northern Tropics that is seasonal in Kenya, Uganda, northwestern and northern Tanzania from February and March through to September and October, the period when it is absent from Ethiopia and Sudan. The range is largely in and west of the Rift Valley from Elgon and Trans-Nzoia, south to the Lake Victoria basin, the central Rift Val-

ley, Narok District and the Loita Plains, the Mara-Serengeti grasslands, the Crater Highlands and the Ardai Plains. It is also seasonal in northwestern Tanzania, south to Ngara and Kibondo districts between June and August. Elsewhere, periodic records at Lake Turkana and Marsabit may refer to birds on passage to and from the Ethiopian highlands. Otherwise, it is locally common in the Lake Victoria basin from February to October with numbers peaking between March and August.

ii). A population that may include birds the Southern Tropics that are seasonally present from November through to April and May, a wet period when it is largely absent from Malawi and Zambia. Wide ranging in the Southern Tanzania highlands from Songea, Njombe, Mbeya and the Ufipa Plateau north to the Wembere floodplains, Iringa District and the Kilombero Valley, and including Ruaha and Mikumi National Parks and the Selous Game Reserve.

Blue Swallow *Hirundo atrocaerulea*

Intra-African migrant from the Southern Tropics April to September when all records are centred around the Lake Victoria basin and peripheral areas, notably the Serengeti-Mara grasslands and Ruma National Park. A count of 630 birds between Sango Bay and Mabamba in August 2001 was the largest number recorded for many years. Elsewhere there are small breeding populations in the montane grasslands of the Iringa, Ukinga, Kipengere, Njombe and Mbeya highlands of southern Tanzania.

Violet-backed Starling *Cinnyricinclus leucogaster*

Cinnyricinclus leucogaster leucogaster (Boddaert 1783). Type locality Benin.

An uncommon intra-African migrant November-February from the Northern Tropics to northwest Uganda and south to Bunyoro and Lango districts. Breeding records (March) from Murchison Falls National Park and Acholi District. Meanwhile all movements are ill-defined and not fully understood. Elsewhere, periodic reports of birds from northwest Kenya and at Lake Turkana may belong here.

Cinnyricinclus leucogaster verreauxi (Bocage 1870). Type locality Angola.

Widespread migrant from the Southern Tropics March to September throughout Tanzania north through southwestern and southern Uganda, and from the Lake Victoria basin to Toro, Mengo, Teso and Karamoja districts; in Kenya, north to Elgon and Saiwa National Parks, Trans-Nzoia, Elgeyu-Marakwet, Baringo, Laikipia, Maralal and Samburu districts, also to Mt Kenya, the Nyambenis and Meru National Park, with sporadic breeding records recorded from the Mara Game Reserve, Nairobi, Saiwa National Park, Elgeyu, Eldama Ravine, and Laikipia. Elsewhere, large flocks are frequently recorded in the coastal lowlands (including on Mafia, Zanzibar and Pemba) north to the Shimba Hills, Kilifi, Tana River and Lamu districts. Several populations may be resident year-round in some southern and south-western Tanzania forests. See also Traylor (1971).

Gambaga Flycatcher *Muscicapa gambagae*

Several instances of night passage (including 16 birds ringed) have been noted at Ngulia, suggesting that it may be a migrant from the Northern Tropics from October to April.

Red-capped Robin Chat *Cossypha natalensis*

Cossypha natalensis intensa Mearns 1913. Type locality Taveta, southeastern Kenya.

Resident and intra-African migrant. Locally abundant in Kenya coastal forests May to October, but largely absent between December and April, yet populations on Zanzibar, in the Pugu Hills, and throughout the Eastern Arc Mountains and in south-eastern Tanzania appear to be, at least in part, sedentary. Also belonging here may be the several resident inland Kenya populations from the Gwassi Hills, Rapogi and Lolgorien east to the Siria (Olololoo) Escarpment, northwest Mara Game Reserve and the Ngurumans, together with those east of the Rift Valley in the Mathews Range, at Mts Uraguess and Endau, the Upper Tana, Meru and Ol Doinyo Sabuk National Parks, and in Taita-Taveta District, while the 21 birds ringed at Ngulia during the November–December rains may also belong here. See also Britton (1971).

Heuglin's Wheatear *Oenanthe heuglinii*

A little known intra-African migrant April to September. In Kenya, records are from north-western border areas at Todenyang and Lockichoggio, south and east to the Lake Turkana basin where it is largely a seasonal visitor to short grass areas particularly after periods of heavy rainfall. Elsewhere, vagrants reported south to Kisumu (July 1917) and Buffalo Springs Game Reserve (November 2013). Probably a regular migrant to Karamoja District, where reportedly seasonally common in moist grasslands in Kidepo Valley National Park.

Spotted Ground Thrush *Zoothera guttata*

Zoothera guttata fischeri (Hellmayr 1901). Type locality near Pangani, coastal Tanzania. Scarce intra-African migrant April to October from the Southern Tropics, typically in lowland coastal forests north to Lamu District, with most records from the Gede and Arabuko-Sokoke forests. Breeding grounds largely unknown but has it has bred in November–December in the Rondo Forest Reserve, south-eastern Tanzania, also in Malawi and South Africa. One ringed at Rondo Forest Reserve in February 1996 was found dead near Diani, south of Mombasa in early June 2003. Meanwhile, numbers reported from Kenya coastal forests appear to have declined in recent years. See also Holsten *et al.* (1991) and Ndang'ang'a *et al.* (2008).

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Donald A. Turner
P.O. Box 1651, Naivasha 20117, Kenya. Email: don@originsafaris.info

Graeme C. Backhurst
2 Reeds Cottages, Windmill Lane, Faversham, Kent ME13 7GT, United Kingdom.
Email: graeme.backhurst@gmail.com

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Short communications

Notes on the nesting site of the Wattled Ibis *Bostrychia carunculata* in the central uplands of Ethiopia

The Wattled Ibis *Bostrichya carunculata* is an Abyssinian highlands (Ethiopia and Eritrea) endemic bird (Rannestad 2016) that occurs only in the Eastern Afromontane Biodiversity Hotspot Key Biodiversity Area (KBA). Classified as a species of 'Least Concern' by the IUCN, it is one of the least known ibis species, with very little information available on its population, ecology, habitat use, breeding biology, or behaviour (BirdLife International 2016). The Wattled Ibis breeds in the Ethiopian highlands during the 'little' rains in March–April (the *Belg* season), and during the 'big' rains in July–September (the *Meher* season), with occasional nesting during the dry season in December (del Hoyo *et al.* 1992, Ash & Atkins 2009). At lower altitudes, breeding is mostly in October (Esayas 2017). It usually nests in small to large colonies on rocky cliffs and trees (Hancock *et al.* 1992, Esayas 2017), but it has also been reported to nest singly, in small groups, and then the nests are more likely to be high up in trees or on ledges of building at lower elevations (1800–2000 m) (Brown *et al.* 1982, del Hoyo *et al.* 1992). In all cases the nest is a modest platform of branches and sticks, mosses, weed stems and other materials, with a diameter between 27 and 37 cm (Esayas 2017). Esayas (2017) reported 30 of 170 occupied nests of Wattled Ibis in 'settlements' on *Acacia* spp., 3–5 m above the ground, without any further information. The observations presented here are my first findings on breeding sites of Wattled Ibis as part of an ongoing ecological study of the species.

The study was done in Seru district (7°35′–7°52′N, 40°11′–40°42′E), 90 km northeast of Bale Mountains National Park (Fig. 1). Seru ranges in altitude from 850 to 2500 m; my observations were made in the central uplands (2000–2500 m). The study area is in the Erteb Weinadega (moist-cool) agro-ecological zone (Ministry of Agriculture 2000). Cropland (mainly wheat) is dominant, average annual rainfall exceeds 1000 mm, and minimum and maximum temperatures average 10° and 25°C, respectively.

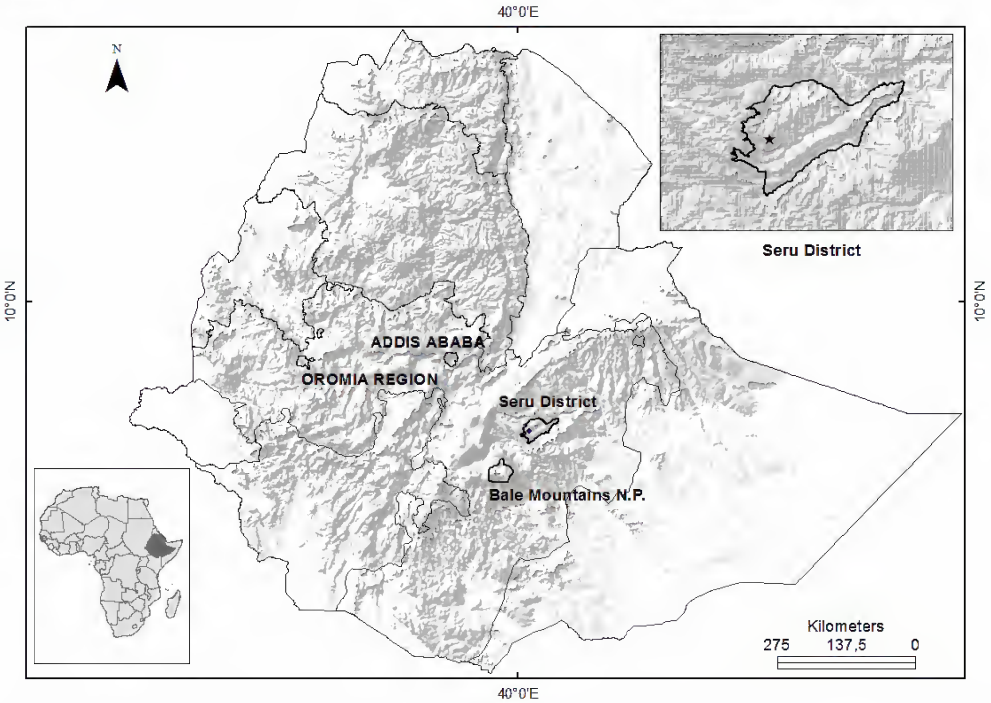

Figure 1. Location of the study area and Bale Mountains National Park in Ethiopia. Star mark shows the location of Seru town and the nest sites.

I followed Hughes' (2006) methods. Although the survey started at the beginning of the rainy season, visibility was good, and transects and some potential point counts were made and tested in the morning (usually between 06:30 and 09:00) when many birds were active and visible.

On 21 September 2016 at 06:40, I saw a Wattled Ibis flying directly towards a 10-m high mukumari tree *Cordia africana* in the backyard of a private house, where it landed and rested low in the tree's canopy. Closer and immediate inspection of the tree revealed a nest containing two feathered chicks with white wing-patches, like the adult's (formed by mainly white wing-coverts), but without wattles. The nest was a modest platform of sticks and small branches, with the cup lined with *Eucalyptus* spp. leaves, 7 m above the ground on a secondary branch of the tree.

After discovering the first nest, I made a rapid tree-by-tree survey in Seru to locate and inspect all private backyard trees that were visible from public streets. On 22 September 2016 at 07:40, I found a second nest, in a 12-m mukumari tree, 332 m from the first nest, at 2480 m, (6 m above ground). The nest contained two feathered chicks at the same stage of development as the first nest (Fig. 2). The nest incorporated some bizarre items such as plastics and ropes as well as the usual sticks and small branches. Because of the security situation in Oromia, I could not visit the area again until 26 December 2016, by which time both nests were totally dismantled. Both householders, who were interviewed in the Oromo language, reported that 2016 was the first year that the ibises had nested in their backyards, and that the birds had dismantled their nests soon after the all chicks fledged.

Figure 2. Two feathered chicks with white wing-patches in the second nest on 22 September 2016.

In 2017, both trees were roosting sites for two pairs of Wattled Ibises, and both started building in May, but breeding was not successful. However, on 31 August 2017, a third nest was found in the compound of the mosque in the nearby town of Bele Gesgar (2471 m), 25 km from Seru. The nest was constructed on a secondary branch of a 25-m *Eucalyptus globulus* tree, 12 m above the ground. Two chicks hatched and fledged successfully.

Even though these preliminary observations are based on a small sample size, they show that some Wattled Ibises use buildings as nesting sites in urban areas (Brown *et al.* 1982, del Hoyo *et al.* 1992) and not only breed in colonies on acacia trees in settlements (Esayas 2017), but that some pairs nest in trees in backyards in small rural towns. This may provide some biological advantages, such as higher reproductive success, as it has been reported for other ibis species (Smith 2009). It might also suggest a specific preference for mukumari trees, which provide an adequate structure to support the nest and a good leafy canopy for insolation, protection, and concealment. The mukumari tree is valued by local people as a good source of timber and livestock forage and is widely planted in backyards.

These observations also establish that, in contrast to some authors (Redman *et al.* 2009, Johnsgard 2009), white wing-patches are present in juveniles and thus are not useful for distinguishing juveniles from adults. Finally, the report of nest-dismantling behaviour after fledging by two different pairs could be the first records of this behaviour in the Wattled Ibis. Nest-dismantling after breeding has been reported in birds under different hypotheses (Li *et al.* 2009), therefore further research is required for this species. It may also explain the difficulty of finding Wattled Ibis nests outside of the breeding season as Hughes reported in the Bale Mountains National Park (Hughes 2006).

Future observations on the Wattled Ibis will concentrate on its breeding behaviour, nesting biology, nest site attendance by the adults, growth of chicks, feeding ecology and behaviour, and daily activity budgets. An effort will be made to determine the prevalence of post-fledging nest-dismantling behaviour in this species, and the Wattled Ibis's possible preference for mukumari trees as nesting sites in small rural towns in eastern Ethiopia.

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Luis Santiago Cano-Alonso

Department of Biodiversity, Ecology and Evolution, Faculty of Biology Sciences, Complutense University, 28040 Madrid, Spain, and IUCN SSC Stork, Ibis and Spoonbill Specialist Group. Rue Mauverney 28, 1196 Gland, Switzerland. Email: catuche.gallego@gmail.com

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A large concentration of Allen's Gallinules *Porphyrio alleni* in Ruaha National Park, Tanzania and other interesting observations of the species in Tanzania

Estimating numbers of waterbirds is important to guide authorities in establishing Ramsar sites. The 1% criterion states that a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird. Another criterion states that a wetland should be considered internationally important if it regularly supports 20000 or more waterbirds. These are the prime reasons for holding regular waterbird counts. With sufficient effort, reasonably accurate counts can be undertaken for the larger, more conspicuous species, and meaningful trends can be established (Monval & Pirot 1989). However, for swamp-dwelling species such as Allen's Gallinule *Porphyrio alleni* that are also nocturnal migrants, this is simply impossible.

Wetlands International have issued five global Waterbird Population Estimates since 1994 (Rose & Scott 1994, 1997, Delany & Scott 2002, 2006, and Wetlands International 2012). Throughout this period the population estimate for *P. alleni* has been within the coded ranges of either, C = 25000 to 100000 birds or D = 100000 to 1 million birds. In other words, no one had any idea how many there were. In the fifth Waterbird Population Estimate (2012) the 1% criterion was set at 10000 birds. There can be very few sites that meet this criterion.

Ihefu Swamp in the north-eastern section of the Usangu Flats is now within Ruaha National Park, having previously been gazetted as a Game Reserve. The birdlife of the Usangu Plains was detailed by Proctor (1968), but Ihefu Swamp is not mentioned by name and Allen's Gallinule is not included in the checklist. Using Google Earth, Ihefu Swamp covers 422 km^2 with a perimeter of 103 km. It is 42 km from the southwest to the northeast, 21 km east to west, and 20 km north to south through the centre of the swamp at 8°21'S, 34°30'E.

On 21 January 2005 we were conducting waterbird counts in the area and approached the southeast edge of the swamp from the village of Ikoga. We soon became aware of considerable numbers of Allen's Gallinules in the flooded grasslands at the edge of the swamp and decided to try to estimate those present. Four of our team were tied together by string at 25 m intervals and began to walk into the swamp towards the deeper water. We positioned our vehicle on a grassy termite mound enabling us to look over the area being surveyed. As the team waded into the water, we counted the gallinules leaving the 75 m wide transect, but not the ones that flew further in front of the beaters/surveyors. 97 birds were counted before the water became too deep to continue. We estimated the transect length at 600 m producing 97 birds for 0.045 km^2 or 2155 birds/km^2 or 1373 birds/km of shoreline, giving a crude estimate of 133000 birds. There were clearly more birds beyond our transect, but we did notice that the numbers decreased towards the end of the transect as the water depth increased.

We are not suggesting that Ihefu held some 150000 Allen's Gallinules at this time (although that is a possibility), but there were surely many more than 10000 birds present and this single count strongly suggests the African population will be well within coded range D and well beyond coded range C.

Moyer (2000) noted large numbers of *P. alleni* at Ihefu during survey work in May 1999 with many birds in juvenile plumage. However, none were present during a follow-up survey in September 1999, strongly suggesting that the large numbers

arrive to breed following the December rains and then migrate away before the end of the dry season.

The Tanzania Atlas database holds only 264 records of *P. alleni* from 63 (18%) Atlas squares. It is a widespread species occurring from near sea level to 1570 m (where they breed) and is surely to be found in many more sites than suggested here. In particular it should be looked for in ephemeral wetlands a month or so after flooding when the wetland vegetation has developed.

Evidence for nocturnal migration in Tanzania includes 9 birds caught and ringed in Mufindi (at 1980 m) in May 1995 (EMB) and individuals that had died striking buildings in Dar es Salaam and Iringa (per. obs.).

Twenty-nine observations from a known breeding locality in Iringa include records from December through to July with egg-laying confirmed in December. There are no records for August through to November although the site was well watched during this period.

Observations from a well-known roadside locality west of Dar es Salaam include records for January (eggs), February (eggs), March, April, May, July, August (eggs), September, and November, suggesting some birds are resident at this site.

In the early evenings, *P. alleni* climb to the tops of the vegetation and fly short distances to feed or interact with other birds. This behaviour is noticeable at all the sites we are familiar with and is sometimes the first indication that birds are in any particular habitat.

On the evening of 16 January 1998 "thousands" were observed moving through the tops of the vegetation in Silale Swamp in Tarangire National Park. At the time this was the first record of this species for this well-watched park. This is probably because night driving is not allowed without special permission, which we were fortunate to have had at the time.

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N.E. Baker & E.M. Baker†

P.O. Box 396, Iringa. Tanzania. Email: tzbirdatlas@yahoo.co.uk

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A 'grey-mutant' paradise-flycatcher *Terpsiphone* sp. from western Uganda

Chapin (1963) discussed in some detail the supposed 'grey mutants' of the African Paradise-flycatcher *Terpsiphone viridis* occurring in southwestern Uganda, eastern DR Congo and the coastal region of Gabon, from where several paradise-flycatchers with black, crested heads, and with bodies, wings and tail wholly or almost wholly dark-bluish-grey had been collected. Such birds were originally treated as either 'melanistic mutants' or as a grey-backed colour phase of *Terpsiphone viridis*.

While there was no mention of these birds in Britton (1980), Friedmann & Williams (1970) commented on a small series of paradise-flycatchers collected in November 1969 from the Kalinzu Forest of southwestern Uganda which included two females with the entire upperparts, wings and tail dark bluish grey, one of which was seen together with, and appeared to be following,, a red-backed, long-tailed male. The series the authors felt, illustrated the polymorphic nature of the African Paradise-flycatcher *Terpsiphone viridis ferreti*.

While birding in Uganda back in 2017, local guide Brian Tuhaise had mentioned to me an all-grey, forest-dwelling paradise-flycatcher *Terpsiphone* sp. that lived in the Maramagambo (Imaramagambo) Forest, in the southern sector of Queen Elizabeth National Park close to the Jacana Safari Lodge. On 20 June 2019 during a return visit to Uganda, and within 50 m from the Safari Lodge, I soon located the distinctive calls of paradise-flycatchers and had my first distant glimpses of the bird, which, true to Brian's information, was entirely grey with a darker sooty head. They were not immediately cooperative towards my photographic attempts but after a few hours I got lucky when I walked right into a male bird that had been sitting quietly. As I fired my shutter, the bird became incredibly excited and performed the most stunning tail-fanning display for 20 s before heading off into the forest. It was quite magical!

The bird was entirely blue-grey with no suggestion of rufous or white; its long central tail streamers eliminated Bedford's Paradise-flycatcher *Terpsiphone bedfordi*as , which is endemic to nearby DR Congo. The head of the male was darker, matt sooty-grey and more in keeping with the African Paradise-flycatcher *Terpsiphone viridis*, and not glossy black as one might expect for a variety of Red-bellied Paradise-flycatcher *Terpsiphone rufiventer*. The eye-ring and extensive gape flange were vibrant blue. The vent was paler grey than breast and belly but not white or rufous.

The call was typical for a *Terpsiphone*, but different from other *viridis* I have encountered in East Africa. The bird responded to playback of *viridis* but ignored playback of *rufiventer*, neither of which were seen at this location.

I am inclined to believe that this undescribed form could possibly qualify for species status using the Tobias criteria, although I am also open to the idea that it could qualify as a subspecies of *viridis* if the parameters for that species were changed, or even as a *stable* hybrid between *viridis* and *rufiventer* as suggested in recent documentation of a near identical-looking bird from southeastern Nigeria that lacked tail streamers (Barshep *et al.*, 2020).

As discussed with Nik Borrow, Gael Vande weghe and a few others, the only way to conclude any debate would be for DNA testing to be performed, but this should be part of a much larger, pan-African study of all *Terpsiphone* taxa as there are several 'species contenders' that may not be as worthy, and vice versa.

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Adam Scott Kennedy
Email: adamscottkennedy@gmail.com

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Does the Ethiopian Swallow *Hirundo aethiopica* occur in Tanzania?

Britton (1980) states that *H. aethiopica* is, "common and apparently resident in open country along the coastal strip south to Tanga, typically nesting under coral overhangs, but also on buildings" and that "there are recent sight records from Moshi and Mtwara in eastern Tanzania." There are no references given in support of these statements. Concerned about the lack of data on this bird, Baker (2001) requested information from the East African birding community but none was forthcoming.

Hirundo aethiopica breeds in buildings in central Kenya but in the southeast it is confined to seacoasts with coral cliffs for nesting (Grant & Lewis 1984). If the species does indeed occur south into Tanzania, it will surely be an expansion of this population and most unlikely to occur many kilometres inland, on buildings.

The 'recent sight record' from Moshi is actually a nest record card dated April 1966 which I have a copy of. Only the scientific name *H. aethiopica* is given and the numbers of pairs as 'numerous'. The Lesser Striped Swallow *Cecropis. abyssinica* (Abyssinia being the old name for Ethiopia) is a common breeding species throughout northern Tanzania. The observer agrees that this was most likely a simple transcription error (C.F. Mann, pers. comm.), which unfortunately continues to be propagated in the literature (Keith *et al.* 1992). Turner & Rose (1989) even stating, "but there are now numerous records as far as eastern Tanzania".

The 'recent' record from Mtwara is also a nest record card dated May 1976. The observer was W.G. Dyson, on a visit to Masasi, which is 140 km from the coast (not Mtwara which is a coastal town) who noted, "other occupied nests nearby on the walls of hotel". I have been unable to find out much about Mr Dyson, but a search suggests he was a forester based in Kenya. I cannot locate any other nest record cards by him nor find him in the ornithological literature. He was most likely in Masasi on a short-term consultancy and would probably have been unfamiliar with the birds in southeastern Tanzania.

The Wire-tailed Swallow *H. smithi* is a locally common and widespread species throughout Tanzania and is often mistaken for *H. aethiopica* by inexperienced observers. I would strongly suggest that this was simply an identification error on the part of Mr Dyson.

Sclater (1930) gives, "south to the Pangani River in Tanganyika Territory for the range of *H. aethiopica*" and from this Britton (*op. cit.*) derived "south to Tanga".

Mackworth-Praed & Grant (1955) simply follow Sclater (1930) without comment. There are no notations in Grant's personal copy of Sclater (1930) which he used when compiling the texts and maps for Mackworth-Praed & Grant (1955) (NEB's private collection). Given that the intervening years cover the period (1928–1946) when R.E. Moreau was resident in northeastern Tanzania, this is a striking absence of records. Sclater & Moreau (1933) do not mention this species and I cannot trace any mention of *H. aethiopica* in the numerous (more than 90) papers of R.E. Moreau that I have been able to access, although seemingly, he spent little time on the coast and his collections do not include any coastal waders. That he and his collectors missed such birds as Usambara Eagle Owl *Bubo poensis vosseleri*, Sokoke Scops Owl *Otus ireneae*, Swynnerton's Robin *Swynnertonia swynnertoni* and East Coast Akalat *Sheppardia gunningi* in the forests of the East Usambaras testifies to the restrictions placed on his time, especially during the war years.

In a long series of papers by N.R. Fuggles-Couchman (1936, 1939, 1946, 1951, 1953, 1954, 1957, 1958, 1962) dealing mostly with northeastern Tanganyika, there is no mention of *H. aethiopica*. Fuggles-Couchman & Elliott (1946) do not mention *H. aethiopica* but their area of concern—north-central Tanganyika—did not include the northeastern coast.

Reichennow (1894) wrote:

"L. 140, F. 105–110 mm. Oberseits glänzend blauschwarz; Stirn rothbraun; Unterseite Weiss, bei jüngeren Individuen theilweise rostfarben verwaschen, mit einem blauschwarzen, in der Mitte unterbrochenen Kropfband; Schwanzfedern mit weissem Fleck auf der Innenfahne.—Bagamoyo."

Translation by Friedemann Vetter: Shiny blue-black on top; Forehead red-brown; White underside, partly washed rust-coloured in younger individuals, with a blue-black crop band, interrupted in the middle; Tail feathers with white spots on the inner vane.—Bagamoyo".

There is no reference to a specimen or a collector. I cannot find any other reference to Bagamoyo in the literature and have not traced any specimens in German museums, but I have not undertaken an exhaustive enquiry.

There is a specimen in the Natural History Museum in Tring whose label states that it was collected by R.M. Meinertzhagen (RMM) on 3 August 1916 at Korogwe on the Pangani River. It is well known that RMM was in northeastern Tanganyika (now Tanzania) during the First World War but there are strong doubts that he was in Korogwe in August 1916. During the 1920s, RMM had already established a bona fide reputation in ornithological circles and Sclater (*op. cit.*) would not have considered questioning this record. It was not until much later that RMM was shown to be a fraud, and his specimens are now under close review and have been withdrawn from general circulation (Knox 1993). It now appears quite likely that RMM was not in Korogwe on that date and that this specimen was either collected by him elsewhere or was stolen and relabelled. We may never know, but this specimen should surely not be the sole reason for Ethiopian Swallow to be included in the avifauna of Tanzania.

A photograph (Fig. 1) of the specimen in Tring is included. It has been examined by Angela Turner who confirms its identification as *H. aethiopica*.

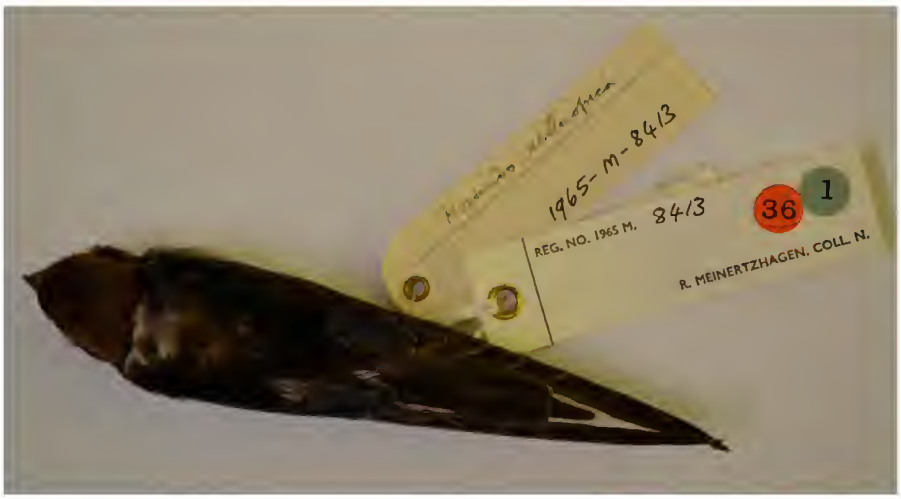

Figure 1. Single specimen in the collection at Tring (photos: Mark Adams).

There has been the occasional record submitted to the Tanzania Atlas, but none has withstood close scrutiny. ebird was accessed on 1 September 2019 when there were 13 records for Tanzania; eight of these are from a single observer who chooses not to engage with any East African birding organization or reply to questions about any of his many sightings. These eight claims of multiple birds with a maximum of eight individuals and one other ebird claim are from a stretch of coast south of Pangani with sandy beaches and no coral cliffs. Other observers who are very familiar with this area have not reported Ethiopian Swallow. There is a single claim from Amani Nature Reserve, a well-watched site with no other claimed observations. There are two claims from Peponi, to the north of Pangani, one of which has since been withdrawn. There is an intriguing claim from the Umba River just to the north of Lunga Lunga in south-eastern Kenya that requires clarification as this is from atypical riverine habitat. There are no claims from the area of Vanga in extreme south-eastern Kenya, but small numbers are well known from Shimoni, 26 km north-northeast of Fish Eagle Point, *c.* 20 km north-northeast of Tanga.

If this coastal population existed in Tanzania, then birds would surely occur close to Fish Eagle Point only 17 km south of the Kenyan border where suitable coral cliff habitat exists. However, despite many visits by experienced field birders over several years, there has not been a single claim from this area.

I believe it would be prudent to remove this species from the avifauna of Tanzania until a well-supported claim has been submitted to, and approved by, the EARC. This note has been approved for publication by the East African Rarities Committee.

Acknowledgements

I thank Mark Adams for providing images and details of the specimen in the British Museum at Tring; Angela Turner for confirming the identification of the specimen; Clive Mann for corresponding on the Moshi Nest Record Card; and Friedemann Vetter for the translation of the German text.

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N.E. Baker
P.O. Box 396, Iringa, Tanzania. Email: tzbirdatlas@yahoo.co.uk

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A record of Chestnut-capped Flycatcher *Erythrocercus mccallii* from Semuliki National Park, Uganda

While birdwatching in Semuliki Forest National Park, western Uganda, on the morning of 11 June 2019, with Per Holmen and our expert ranger-guide Olibokiriho Justice, we were fortunate to enjoy good views of the sought-after African Piculet *Sasia africana*, a species new to Per and me. No sooner had the bird disappeared into the wooded swamp, Justice drew our attention to some lively, chattering notes coming from directly above us. As we looked up, two birds flew a short distance and Justice called them out as Chestnut-capped Flycatchers *Erythrocercus mccallii*, another new species for Per and me. We all managed good binocular views and I was able to locate one of the birds through my camera viewfinder even though they were, by now, some distance away. The resulting image clearly shows the plumage characters of this species: orange-chestnut crown and tail, greyish nape and ear coverts, buffy throat and paler underparts, and olive-brown upperparts, leaving the identification in no doubt. In terms of behaviour, the two birds were quite vocal and, at times, rather hyperactive before remaining quiet for several moments. Tail-wagging, a characteristic of the genus, was witnessed although not as frantically as one might expect.

Having recognized the call so quickly, I assumed that Justice knew these birds well from the site. However, this appears to be a new locality and elevation (700 m) for the species in East Africa and worthy of documentation.

Britton (1980) says of *Erythrocercus mccallii*, "The race *congicus* is reasonably common in the undergrowth, mid-stratum and canopy of forest at Budongo in W Uganda", and Stevenson & Fanshawe (2002) state the altitude of 1100 m at the same location as the only site for the species in the region.

I have since contacted Johnnie Kamugisha and Herbert Byaruhanga, two of Uganda's most experienced birdwatchers, and both are familiar with this flycatcher at Semuliki National Park. Additionally, Herbert has seen the species in forest "between Masindi and Fort Portal"(pers. comm.).

Accordingly, I feel it would not be a surprise to find the Chestnut-capped Flycatcher in suitable habitat between Budongo and Semuliki Forest, and it should be both looked and listened for during future visits to the area.

Acknowledgements

I am grateful to Per Holmen and Olibokiriho Justice for their company and expertise in the field. Thank you to both Johnnie Kamugisha and Herbert Byaruhanga for sharing their experiences with the species in Uganda. Thanks also to Don Turner and Brian Finch for their comments.

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Adam Scott Kennedy
Email: adamscottkennedy@gmail.com

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All-white hirundines in Uganda

In May 1992, during a visit to Bugala Island, one of the Ssesse Islands at the north of Lake Victoria, I spent some time in the forest, which was then extensive. When about a kilometre into the forest, I came to a clearing where I sat for a while and then noticed a flock of white birds spiralling around above the canopy of a tall emergent tree. There were 25 to 30 birds, clearly hirundines. I watched them in sunny weather for at least an hour that first time, but they never once ventured below the canopy, not really surprising, perhaps, for hirundines. Their bills were dark, probably black. They had the outline of saw-wing swallows, and there were no tail streamers, but they had deeply forked tails. I heard no calls and they were out of range of the camera and lens I had with me. I returned several times over the next six days and must have observed these birds for around seven or eight hours in total. For part of the time I used binoculars to enable me to confirm repeatedly that they were indeed pure white, with no other plumage markings. As there is no all-white swallow in the world (del Hoyo & Collar 2016), I assume that they were most likely leucistic White-headed Saw-wings *Psalidoprocne albiceps* which they most closely resembled in form. (The Black Saw-wing *P. holomelas*, which was also seen on Bugala Island, but never at the same time as the all-white birds, has a much more markedly forked tail.) Since there were at least 25 pure white birds, it seems likely that they were of more than one generation, and that the leucism was therefore inherited. It would be very interesting to know if any more recent records exist from Bugala Island.

Readers are entitled to an explanation for the delay in the publication of these observations. About three months after I had made them, I wrote a letter to Makerere University, Kampala, detailing my observations, but heard nothing; this was not really surprising because it was not addressed to anyone in particular. Soon after, I moved away from East Africa to take up teaching posts in Botswana (five years) and Swaziland (as Eswatini was then called), for 11 years, consequently, I forgot all about following up my letter to Makerere. Earlier this year (2020) I mentioned these all-white hirundines to a friend, who asked me if I had published; when I related what had happened, he urged me to do so even though it was so long after the sightings. Thus, I have done so now. I might mention that I have been birdwatching since 1958, throughout Europe, 15 African countries, the Himalaya (Ladakh) and Australia.

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Clive Denby
Lake View Residential Care Home, Brookside, Brookside Avenue, Telford TF3 1LA, UK
Email: scolopax939@gmail.com

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East African Rarities Committee Report for 2019

David Fisher (Chairman) and Nigel Hunter (Secretary) on behalf of the EARC

The East African Rarities Committee assesses records of new and very rare birds occurring in Kenya, Tanzania, Uganda, Rwanda and Burundi. This includes up to the fifth record of any species from each of the five countries. Sightings of species for which there are fewer than five records for a country should be submitted to the EARC Secretary, Nigel Hunter, P.O. Box 24803, Karen 00502, Nairobi, Kenya; Email: nigelhunter74@gmail.com. The country lists with less than five records and the EARC rarity form are available as downloads from the EARC website (www.eararities.org). Please contact the Secretary to obtain clarification of whether a record requires a submission and for guidance on what details to include in the submission. Past records of rare species are also sought in order to bring the EARC database up to date. Nomenclature follows the *Checklist of the Birds of Kenya* 5th edition (Bird Committee 2019) unless stated otherwise.

Since the Committee's last report published in 2019 (*Scopus* 39(2): 44–48) the following records have been accepted:

White-crested Turaco *Tauraco leucolophus*

New record for Rwanda. A single bird seen and photographed at Akagera National Park on 28 September 2019 (Dru and Cheryl Jarayane).

Pacific Golden Plover *Pluvialis fulva*

Fourth record for Uganda. A single bird seen and photographed at Queen Elizabeth National Park on 05 January 2019 (Tuhaise Brian Asaba).

Slender-billed Gull *Chroicocephalus genei*

Second documented record for Uganda. A single bird seen and photographed at Kazinga Channel, Queen Elizabeth National Park on 02 December 2017 (Crammy Wanyama, Chris Sloan, Mike Todd, Gary Brunvoll, Terri Brunvoll, Dan Jacobson, Kathy Jacobson, Shannon Sloan, Kevin Calhoon).

Figure 1. Slender-billed Gull *Chroicocephalus genei* (photo: Chris Sloan).

Figure 2. Eurasian Wryneck *Jynx torquilla* (photo: Charles Francis).

Lesser Frigatebird ***Fregata ariel***
Fifth record for Kenya. A single bird was seen at Diani–Galu Beach, South Coast, on 9 December 2018 and again on 24 December 2018 with a description provided (Shiv Kapila).

Short-toed Snake Eagle ***Circaetus gallicus***
Second record for Kenya. A single adult was seen and photographed approximately 25 kilometres east of Lokichogio, northern Kenya on 29 January 2004 (Bill Clark and Itai Shanni). Further details of this record are provided in Clark *et al.* (2005).

Beaudouin's Snake Eagle ***Circaetus beaudouini***
Third and Fourth record for Rwanda. The first sighting was a single bird observed and photographed at Akagera National Park on 10 December 2016 (Gaël Vande weghe). The second sighting was also observed and photographed at Akagera National Park but on 21 January 2019 (Shlomi Segall and Claudien Nsabagasani).

Congo Serpent Eagle ***Circaetus (Dryotriorchis) spectabilis***
Third record for Uganda. A single bird was observed in response to playback, giving good flight views at Semliki National Park on 26 July 2019 with a description provided (David Hoddinott).

Cassin's Hawk Eagle ***Aquila africana***
Fourth record for Kenya. A single bird was observed and photographed on the Chogoria route, eastern slopes of Mount Kenya on 4 August 2019 (Nick Trent). Further details of this record are provided in Trent (2019).

Eurasian Wryneck ***Jynx torquilla***
Second record for Tanzania. A single bird was observed and photographed on the road between Lake Natron and Namanga on 20 February 2019 (Kevin Mlay and Charles Francis).

Isabelline Shrike ***Lanius isabellinus***
First documented record for Rwanda. A single bird was observed and photographed at Akagera National Park on 3 December 2018 (Michelle Summers).

Steel-blue Whydah ***Vidua hypocherina***
Fifth record for Uganda. One adult male in full breeding plumage was observed in Kidepo National Park on 23 July 2019 with a description provided (David Hoddinott).

Bush Petronia ***Gymnoris dentata***
Fifth record for Uganda. Five birds including one male were observed in Kidepo National Park on 23 July 2019 with a description provided (David Hoddinott).

Ortolan Bunting ***Emberiza hortulana***
Second and third record for Tanzania. The first sighting was a single bird observed and photographed at Serengeti National Park on 11 October 2017 (Daryl Dell). The second sighting was again of a single bird observed and photographed at Lake Manyara National Park on 19 October 2017 (Daryl Dell).

Figure 3. Ortolan Bunting *Emberiza hortulana* (photo: Daryl Dell).

Figure 4. Dusky Lark *Pinarocorys nigricans* (photo: Rich Lindie).

Dusky Lark *Pinarocorys nigricans*

Second record for Uganda. Two birds were observed and photographed at Queen Elizabeth National Park on 4 July 2018 (Rich and Kim Lindie).

Desert Cisticola *Cisticola aridulus*

New record for Uganda. A single bird was observed calling and displaying and then photographed about 8 km from Moroto Town on the road to Kidepo on 21 July 2019 (David Hoddinott, C.J. and Angie Cederlund).

Figure 5. Desert Cisticola *Cisticola aridulus* (photo: Angie Cederlund).

Figure 6. Grey Ground Thrush *Geokichla princei* (photo: David Hoddinott).

Rose-coloured Starling *Pastor roseus*

New record for Tanzania. A single adult was observed and photographed about 40 km from Arusha on the road towards Tarangire National Park on 9 September 2019 (Kevin Mlay).

Gambaga Flycatcher *Muscicapa gambagae*

Fourth record for Uganda. A single bird was observed and photographed at Kidepo National Park on 23 July 2019 (David Hoddinott)).

Pied Flycatcher *Ficedula hypoleuca*
Fifth record for Kenya. A single immature male was seen and photographed at National Museums of Kenya, Nairobi between 27 February 2019 and 6 March 2019 (Sidney Shema, Brian Finch and Kelvin Gichuki).

Collared Flycatcher *Ficedula albicollis*
Fourth record for Rwanda. A single adult male was observed at Mount Rebero, Kigali on 18 March 2016 with a description provided (James Hogg).

Capped Wheatear *Oenanthe pileata*
New record for Rwanda. A single bird was observed and photographed at Akagera National Park on 23 December 2018 (Gaël and Jean Pierre Vande weghe).

Grey Ground Thrush *Geokichla princei*
Third record for Uganda. A single bird was observed and photographed whilst nest building at Semliki National Park on 27 July 2019 (David Hoddinott).

The following records were Rejected because the details provided were insufficient to establish the identification with certainty:

Somali Bee-eater *Merops revoilii* at Himo, Moshi District, Tanzania on 30 June 2019.

Pied Flycatcher *Ficedula hypoleuca* at Mt Elgon, Trans Nzoia County, Kenya on 24 February 2019.

Acknowledgements

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David Fisher
56 Western Way, Sandy, Bedfordshire, SG19 1DU, United Kingdom. Email: d.j.fisher@ntlworld.com

Nigel Hunter
P.O. Box 24803, Karen 00502, Nairobi, Kenya. Email: nigelhunter74@gmail.com

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Antony Lucien Archer (1933–2020)

Tony Archer sadly passed away on 23 February 2020 following several years of ill health, ending a long and eventful life, from police officer to a highly respected professional hunter and, later, a talented observer of the natural world around him, most notably birds.

Tony was born on 16 February 1933 to Ruth and Kenneth Archer. His father was a Nairobi lawyer and founder of the Archer & Wilcock firm of solicitors. Following his education at Pembroke House, Gilgil and the Prince of Wales School, Nairobi, Tony completed a period of military service with the Kenya Regiment in Kenya and the then Southern Rhodesia.

In 1952, Tony joined the Kenya Police and in 1953 was posted to Embu District where for three years he worked in the District Special Branch Office, and in 1956 was awarded the Colonial Police Medal for Meritorious Service. Following his days in the Kenya Regiment and Kenya Police, Tony later joined Ker & Downey Safaris as a professional hunter, becoming one of its directors, as well as an influential member of the East African Professional Hunters' Association, working tirelessly in support of ethical hunting practices. In 1967 he married Elizabeth (Betty) Brierley, later to feature prominently in Kenya ladies golfing circles.

Throughout his youth, Tony had maintained a deep interest in natural history and in particular birds, and like so many at the time, he was encouraged and stimulated by the then ornithologist at Nairobi's Coryndon Museum, John Williams, who soon taught Tony how to collect and prepare a study specimen. In 1957 Tony was instrumental in assisting a British Museum expedition to Angola, during which he also collected a few bird specimens himself, among them a particularly interesting form of the Angola Lark *Mirafra angolensis*, and which in 1958 Pat Hall (then Head of the British Museum's Bird Room and leader of that 1957 expedition) named *Mirafra angolensis antonii* after its collector A.L. Archer. Similarly, in 1961, Tony collected a small Red-billed Oxpecker near Archer's Post (named after Sir Geoffrey Archer) in northern Kenya, which he gave to John Williams for the Coryndon Museum bird collection. Several years later the then National Museum ornithologist, G.R. (Chum) Cunningham van Someren, named and described that small oxpecker as *Buphagus erythrorhynchus archeri*, again after its collector, and although the name remains, it is no longer considered a valid subspecies.

Later, in 1963 and from 1967 to 1969, John Williams (Coryndon Museum, Nairobi) and Herbert Friedmann (Director of the Los Angeles County Museum) organized a series of expeditions to the western Uganda forests, where Tony was given the responsibility of heading up a team of experienced collectors and skinners. During this period Tony spent much of his time between the Bugoma, Bwamba, Kibale, Malabigambo and Sango Bay forests whence some of the finest collections of birds were obtained; these are currently housed in the Los Angeles County Museum in California.

Throughout the 1970s and 1980s, as the tourism industry in Kenya enjoyed a boom period, Tony's life was largely taken up with endless safaris, and I myself well recall one such 'birding' safari in September and October 1978 when we, together with a small convivial group of American friends, travelled through southern Africa from Cape Town to Namibia, Botswana and Zambia. It was a memorable experience for us both, and one that we reminisced together over a beer or two, or three for many years afterwards.

During the late 1980s and for several years thereafter, Tony became pre-occupied with Indian House Crow Control Programmes on Zanzibar and Pemba, in conjunction with FINNIDA (the Finnish International Development Agency) and the Commission of Lands and Environment, Zanzibar. Tony's expertise in managing to control the ever-increasing numbers of House Crows *Corvus splendens* on both islands was nothing short of remarkable, and within a few years crow numbers were dramatically reduced. His definitive paper 'Control of the Indian House Crow in Eastern Africa' presented at the 10th Pan-African Ornithological Congress in Kampala, Uganda in 2000 laid the cornerstone for all later House Crow control programmes along the Kenya and Tanzania coasts.

Tony's other interests included being a founding partner and director of 'Wildlife Services Ltd' along with Ian and Christine Parker, Alistair Graham and Alan Root, while some years later he and Betty acquired ownership of an already established Nairobi travel agency.

Sadly, in the late 1990s Tony's health began to deteriorate, but being the stoic and positive person that he was, he was determined to fight on, and in 2017 he and Betty celebrated their Golden Wedding Anniversary in style, along with close family members, relatives and friends at their beautiful Nairobi home. Tony is survived by his wife Betty, son Nigel (following in his father's footsteps), daughter and son-in-law Alexandra (Alex) and Richard Bell, and grandchildren Acacia and Carrisa.

Donald A. Turner

Scopus 40(2): 95–96, January 2020

Request for any information, reports, and photographs on these rare and highly localized western Kenya birds

Ring-necked Francolin *Scleroptila streptophora*

Shining-blue Kingfisher *Alcedo quadribrachys*

Blue-breasted Kingfisher *Halcyon malimbica*

Locust Finch *Paludipasser locustella*

Pale-eyed Black Tit *Melaniparus guineensis*

Little Grey Greenbul *Eurillas gracilis*

Please send full details to:
Don Turner
Email: don@originsafaris.info

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SCOPUS: Journal of East African Ornithology

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Cover illustration from a gouache painting by P.A. Clancey

Instructions for contributors

Scopus: Journal of East African Ornithology welcomes original contributions — which have not been published elsewhere — on all aspects of the ornithology of eastern Africa, encompassing the area from Sudan, Ethiopia and the Horn of Africa countries south to Mozambique, and including the Malagasy region.

Contributions comprise original (full) papers, short communications (normally under two pages in length, including short notes and records) and letters. Original articles and short communications should present some new findings that have not been published or been submitted for publication elsewhere. All submissions are subject to peer review. They will be assessed by at least one member of the editorial board as well as by independent referees.

The text must be written in (British) English following the preferred (first) spelling of the *Oxford dictionary of English*, Third edition, 2010, or later. Please type nothing in all capital letters unless the word is always spelled that way, e.g., 'UK'. Please include between four and six keywords for full papers, only. When preparing your manuscript, please follow the conventions used in *Scopus* and refer to a recent issue (volume 34 onwards) for guidance. Some examples of conventions are:

Papers: Title, authors' names, Summary or Abstract, body of the paper with any desired sub-headings, Acknowledgements (if any), References, names and addresses of the authors, Appendices (if any).

Short notes: Title, text (no Summary required), Acknolwedgements (if any), References, names and addresses of the authors.

Units: Metric units and their SI equivalents and abbreviations should be used. The

abbreviation should be preceded by a space, '5 km' not '5km'. Latitudes and longitudes in degrees and minutes, not decimal degrees.

Dates: 21 February 2001 [note the order, no comma, not 21st].

Time of day: 13:00 [note colon, no 'hours', 'hrs' or 'h'; 'h' is a unit of time, not of time of day].

Names of birds: For example, African Thrush *Turdus pelios* [no comma, no parentheses, no author's name or date (unless pertinent to a point in the text)].

References cited in the text: Cite multiple references in chronological order, separated by commas, e.g. (Njoroge & Launay 1998, Mlingwa *et al.* 2001) [note ampersand, italicized '*et al.*', no comma between authors' names and date].

List references at the end of an article: See the examples below for format. When printed, authors' names appear in capitals and small capitals *but they should be typed in ordinary roman as shown below.*

Give names of journals in full. (For books, after author(s), year of publication and title, give town followed by the publisher.) Examples:

Cordeiro, N.J. & Githiru, M. 2000. Conservation evaluation for birds of *Brachylaena* woodland and mixed dry forest in northeast Tanzania. *Bird Conservation International* 10: 47–65.

Stuart, S.N., Jensen, F.P., Brøgger-Jensen, S. & Miller, R.I. 1993. The zoogeography of the montane forest avifauna of eastern Tanzania pp. 203–228 *in* Lovett, J.C. & Wasser, S.K. (eds) *Biogeography and ecology of the rainforests of Eastern Africa*. Cambridge: Cambridge University Press.

Urban, E.K., Fry, C.H. & Keith, S. (eds) 1986. *The birds of Africa*. Vol. 2. London: Academic Press.

BirdLife International 2013. Species factsheet: *Balearica regulorum*. Downloaded from http://www:birdlife.org on 14/05/2013.

Both English and scientific names of birds should be given when the species is first mentioned — in the title and in the text — thereafter only one name should be used but both English and scientific names should be given in captions to figures.

Bird names should be those of a stated work. Any deviations from this work should be noted and the reasons given.

Black-and-white or colour photographs and line illustrations should be provided as separate graphic files in JPEG or TIFF format. All articles should be submitted by email in Microsoft Word or as a Rich Text Format (RTF) file.

Please send all contributions to The Editors, *Scopus: Journal of East African Ornithology*, Email: scopus@naturekenya.org

Rare birds in East Africa

Records of rare birds from Kenya, Tanzania and Uganda are assessed by the East Africa Rarities Committee. Records from other countries in the region can also be submitted for review and possible publication in *Scopus*. A full account of the record should be sent to the committee Chairman, Nigel Hunter (nigelhunter@timbale.org) and the *Scopus* editors.

The East Africa Natural History Society

Nature Kenya, P.O. Box 44486, 00100, Nairobi, Kenya; tel. +254 (0) 2 3749957/3746090; email: office@naturekenya.org

Nature Uganda, P.O. Box 27034, Kampala, Uganda; tel. +256 (0) 41 540 719, fax 533528; email: eanhs@imul.com

National Bird Mapping Projects

Kenya Bird Map
kenyabirdmap.adu.org.za

Tanzania Bird Atlas
tanzaniabirdatlas.com